

NATIONAL GEOGRAPHIC

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SEA MONSTERS

**SCIENTISTS BRING
"GODZILLA" BACK TO LIFE**

PLUS: MONSTER SUPPLEMENT

MONSTERS OF THE DEEP

To rule the oceans for 185 million years, sea monsters—ancient land reptiles that crawled into the water—evolved features like huge eyes up to 10 inches across, the eye of *Temnodontosaurus* (shown actual size, reflecting squid-like prey) is among the largest on record. The behemoths



1. *SHONISAURUS SIKANNIENSIS*

220–210 million years ago

A true monster, this Triassic ichthyosaur—largest marine reptile known—may have stretched 75 feet or more.

2. *ARCHELON ISCHYROS*

74 million years ago

Biggest marine turtle on record, this Cretaceous behemoth was 15 feet long and weighed more than two tons.

3. *TEMNODONTOSAURUS PLATYODON*

195–175 million years ago

Looking like a fish-porpoise hybrid, this early Jurassic reptile had acute vision in deep, dark water.

4. *NOTHOSAURUS GIGANTEUS*

230 million years ago

A 13-foot ambush predator from the Triassic period, it wielded lethal fangs up to four inches long.

5. *THALASSOMEDON HANINGTONI*

95–93 million years ago

This 40-foot Cretaceous plesiosaur had a neck like a crane that could maneuver toward unsuspecting prey.

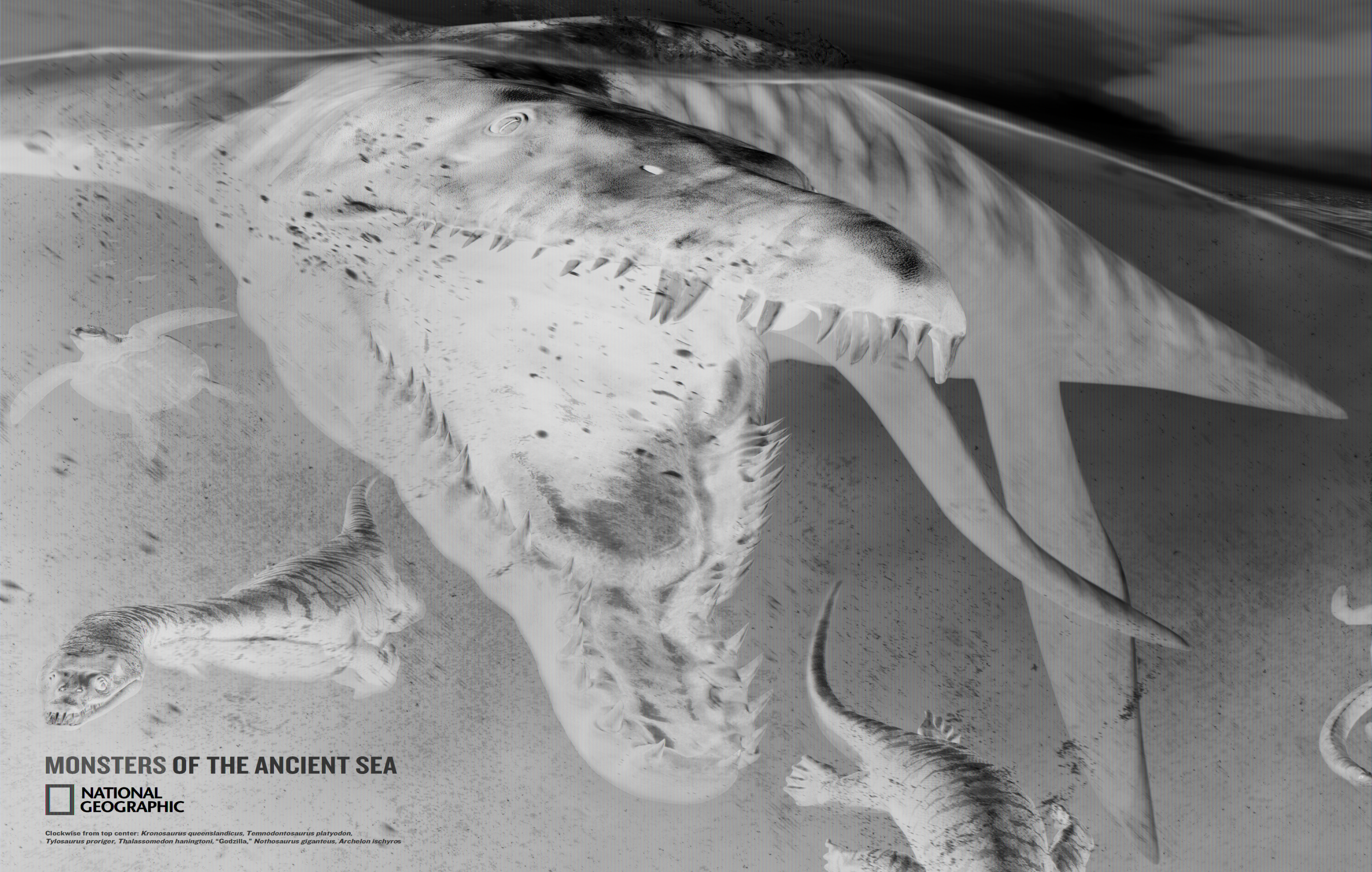
6. “GODZILLA”

135 million years ago

A Cretaceous hunter-scavenger, Godzilla is a recent find. As of press time, it was still awaiting a scientific name.

► Ancient monsters from the deep come alive. See them hunt. Follow an interactive time line and control 3-D models. Zoom in on horrific sea creatures in a map from A.D. 1539. Join our forum—Sea Monsters: Fact or Fiction? Download desktop wallpaper at ngm.com/0512.

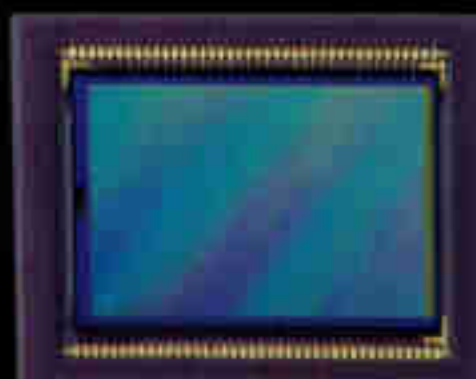
SUPPLEMENT TO NATIONAL GEOGRAPHIC, DECEMBER 2005
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MONSTERS OF THE ANCIENT SEA



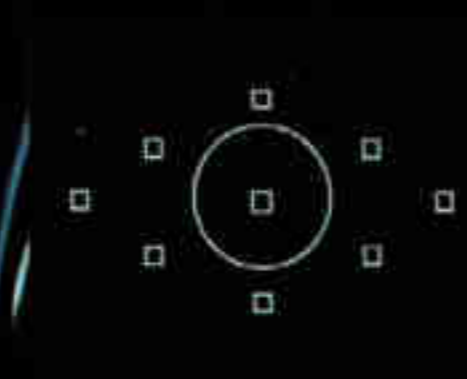
Clockwise from top center: *Kronosaurus queenslandicus*, *Temnodontosaurus platyodon*,
Tylosaurus proriger, *Thalassomedon haningtoni*, "Godzilla," *Nothosaurus giganteus*, *Archelon ischyros*



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Yet its most remarkable attribute just might be that all this creative control is available in a camera designed for the serious amateur.

Just look at what the EOS 20D has to offer. It reads like a professional wish list: 8.2 megapixels, 5 frames per second, the DiGiC II chip, rigid magnesium alloy body, improved battery life,* compatible with over

50 of Canon's legendary EF lenses. Not to mention 9-point wide-area AF, plenty of customizable settings and a pop-up flash. Imagine getting all this creative control in a rugged, comfortably designed, easy-to-use camera.

In fact, with this level of control and creativity, the only thing the Canon EOS 20D blurs is the line between "professional" and "amateur."

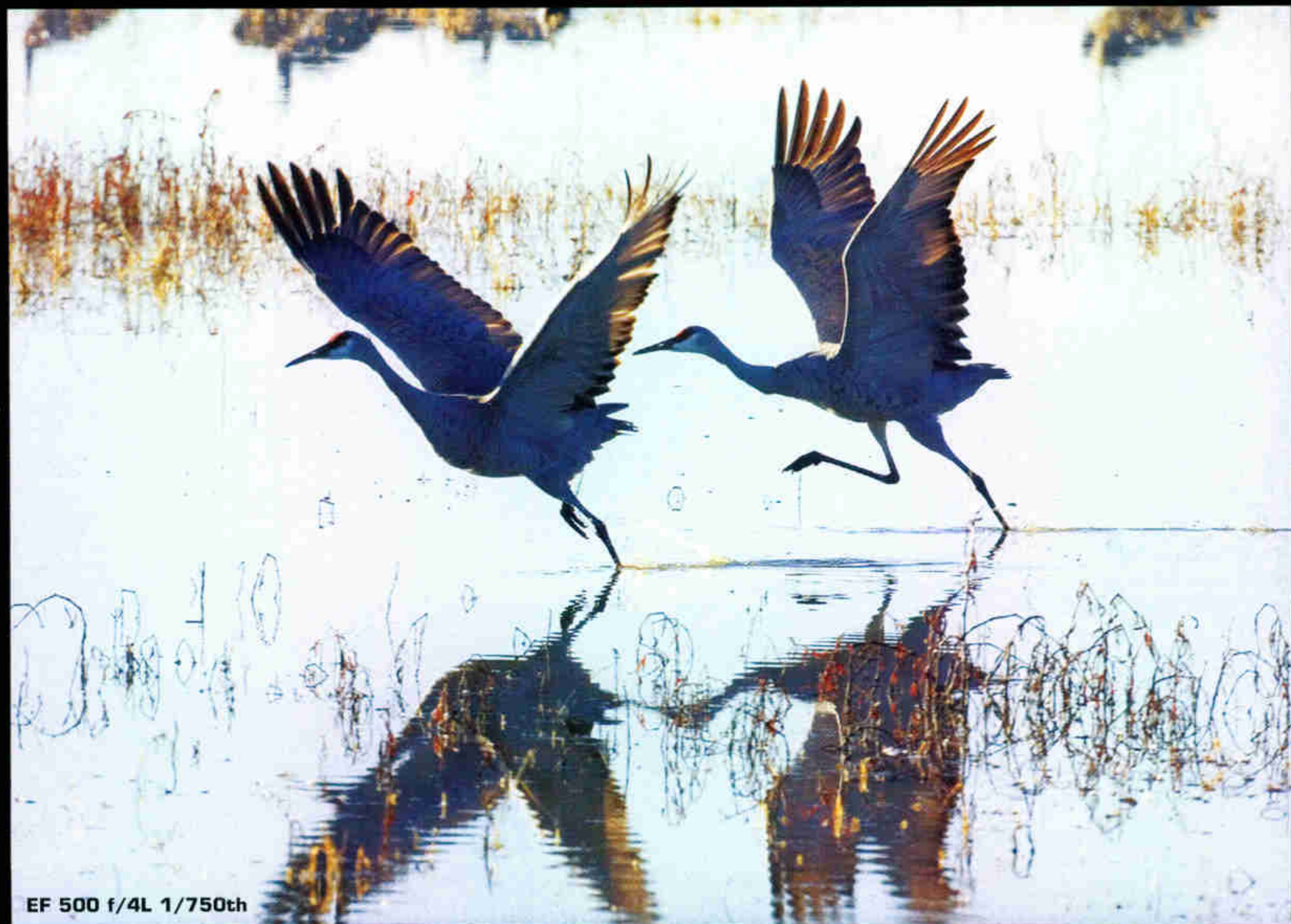


EF 180 f/3.5L 1/500th



EF 100-400 f/4.5-5.6L 1/2

And how George Lepp turns those features into photographs.



EF 500 f/4L 1/750th



George Lepp

Nature photography has been my passion for almost 50 years. In that time, I've seen some of the most exquisite wonders of nature, not to mention amazing innovations in the world of photography. And the EOS 20D surely tops that list.

What I love most about the EOS 20D is the creative control it gives me. Take the

shot of these Sandhill Cranes taking off.

For fast-moving action like this, the EOS 20D really excels. The 5 frames per second capture rate and the sophisticated DiG!C II Image Processor, combined with the fast EF 500mm f/4L IS USM telephoto, allow me to set a high ISO to stop the action, while still getting in close for all the details. And with the lightning-fast auto-focus and unparalleled Image Stabilization, I can concentrate on

composition, not camera settings.

It seems to me that the brilliant design I find in nature is matched only by the entire range of EOS cameras and EF lenses.

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THE COVER

A prehistoric sea monster blasts out of the ocean at a low-flying pterosaur.

ART BY DAMNFX

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The Allure of Machu Picchu

"EVERYONE HAS THEIR OWN SACRED EXPERIENCE at Machu Picchu," says author and filmmaker Karin Muller. As one of the world's most mysterious ancient ruins, Machu Picchu, a vestige of the Inca Empire, is the most visited site in Peru. "Some people watch the early morning shadows move over the ruins, others tour the site and learn about the Inca, and some people like to go in at night," says Muller, who, with a grant from National Geographic, spent six months documenting her escapades along the 4,000 mile Inca Trail.

Muller likes to tap into the mysticism of the area with a hike up Huayna Picchu, the famous pointy mountain which looms over the city. "When you hike, you

really get a sense of what the Inca had to overcome to create Machu Picchu. Even with so many disadvantages—no wheel, no beast of burden except the llama—they built something of such tremendous size and complexity," she says. "It's incredibly rough and rugged. I once went off the trail and it took me two and half hours to go 150 feet," says Muller.

But Machu Picchu is only one stop in a long list of places to visit in the Sacred Valley. "I suggest people also visit Ollantaytambo, a massive citadel which has a living Inca village at its base. When you walk the streets of this wonderful town, you can get a feeling for how the Inca lived. The special customs, the traditions, the rich culture—it's all still there."

National Geographic Expedition to Machu Picchu and the Amazon



Karin Muller
Author, Filmmaker
and Adventurer

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HURRICANE KATRINA SURVIVORS IN NEW ORLEANS AWAIT HELICOPTER RESCUE. TYLER HICKS, NEW YORK TIMES

When tragedy strikes, we often ask, “What can I do to help?” Compassion is one of our greatest strengths as humans. Within a month after Katrina, the Red Cross had more than a billion dollars in pledges for hurricane relief. After last December’s tsunami in Indonesia, people from around the world committed almost seven billion dollars to the humanitarian effort, more than aid agencies could hope to spend. And as we go to press, the world reaches out to Pakistan after the worst earthquake in its history.

But disasters fall out of the limelight, and sometimes aid dries up. “Humanitarian responses are a bit like a lottery,” says Jan Egeland, head of the UN’s humanitarian office in New York. “The 30-odd crisis-ridden societies around the world play that lottery every night. But only one or two a year will win—if they’re lucky.”

How does the lottery of compassion determine who gets relief and who doesn’t? This month, in our two-part story “Hope in Hell,” Chris Carroll, Ed Girardet, and John Stanmeyer bring us to the front lines of humanitarian aid to explore the dice-roll of life and death. They give voice to those who dedicate their lives to helping others. From my own experience I know there is nothing more poignant than to look into the eyes of suffering. And there is nothing more human than to ask: “What can I do to help?”

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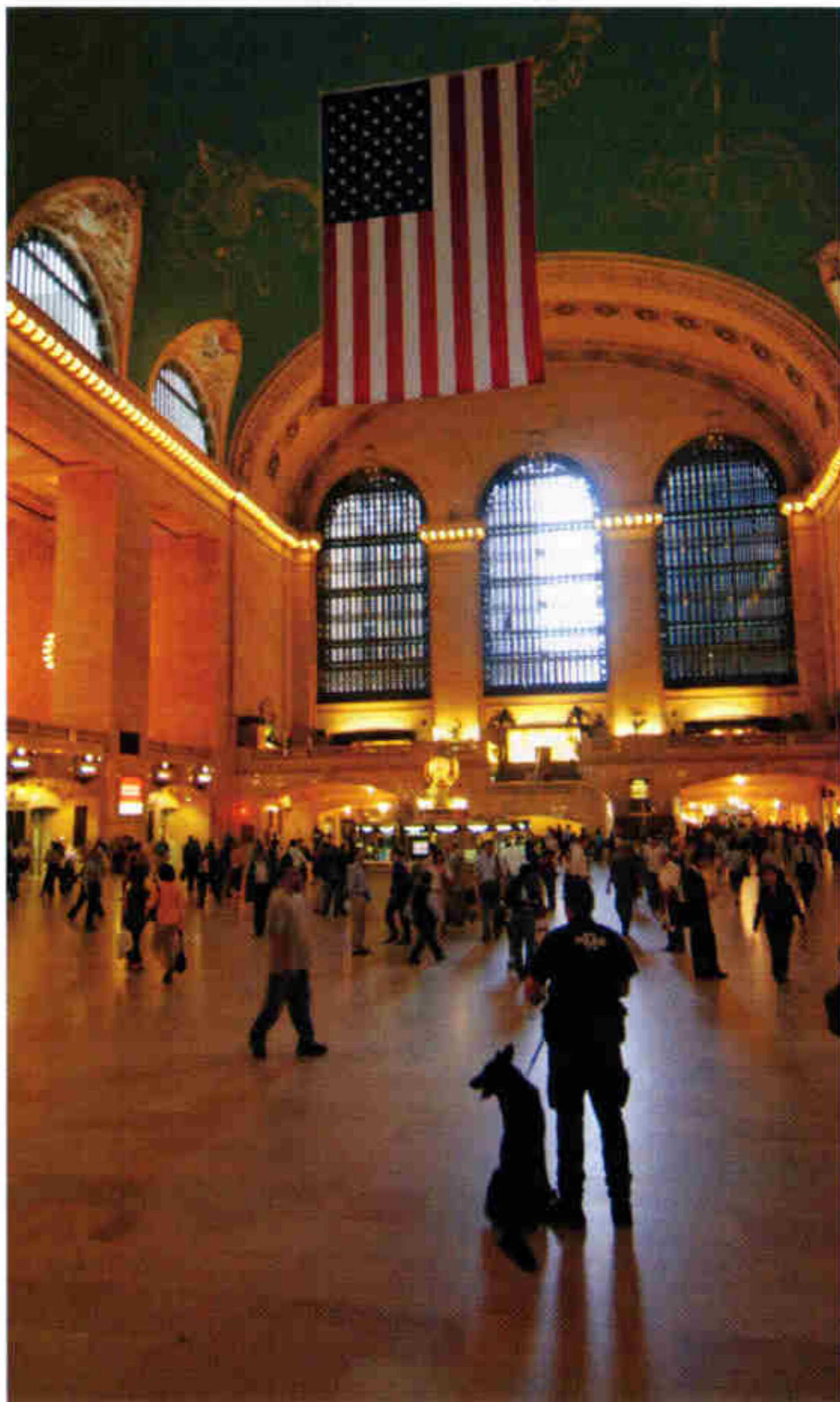
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8-10 P.M. ET/PT

Inside Grand Central

This New York City crossroads has seen it all. Glamorous rail travelers, war-supply trains, encampments of the homeless, powerful politicians, and billions of commuters have passed through its tunnels and vaulted halls.

Since its gala opening in 1913, Grand Central Terminal (right) has survived war, neglect, and a near encounter with the wrecking ball. Gleaming after a multimillion-dollar renovation, the station has reclaimed its place as the hub and heart of New York's bustle. *Inside Grand Central* reveals the inner workings of this monument to modern engineering for the first time and brings its incredible history to life.



NOW ON DVD

March of the Penguins

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This powerful documentary



follows the remarkable, and sometimes harrowing, journey of emperor penguins as they cross forbidding Antarctic wastes to mate, give birth, and nurture the next generation of chicks.

Find out what's on and how to get the Channel in your area at nationalgeographic.com/channel. Programming information accurate at press time. Consult local listings.

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MEET THE SEA MONSTERS Rotate 3-D models of the creatures to see them from every angle. Watch two animated sea monsters, *Thalassomedon* and *Temnodontosaurus*, come alive and pursue their prey. ■ **TIME LINE Navigate** an interactive time line of the underwater monsters in this first installment of a chronology of prehistoric creatures at ngm.com/0512.

IRON MEN Who are the three toughest men and women in the National Geographic community? The race is on to find the Society's most formidable representatives, the kind of steely-eyed adventurers who would make Indiana Jones wish he'd stayed in the classroom.

■ **SEE THE CONTENDERS** online at nationalgeographic.com/chronicles.

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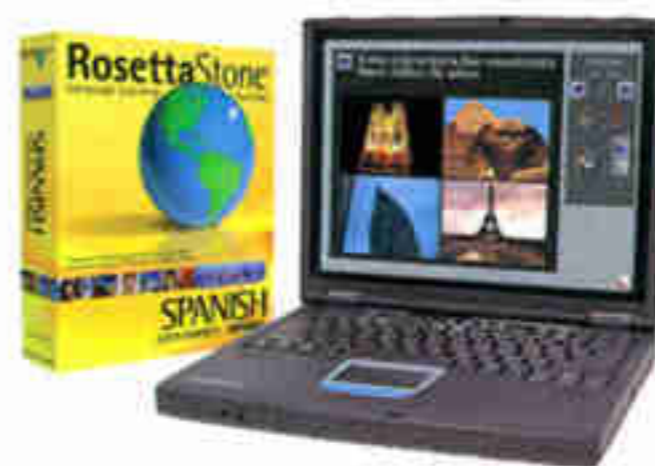
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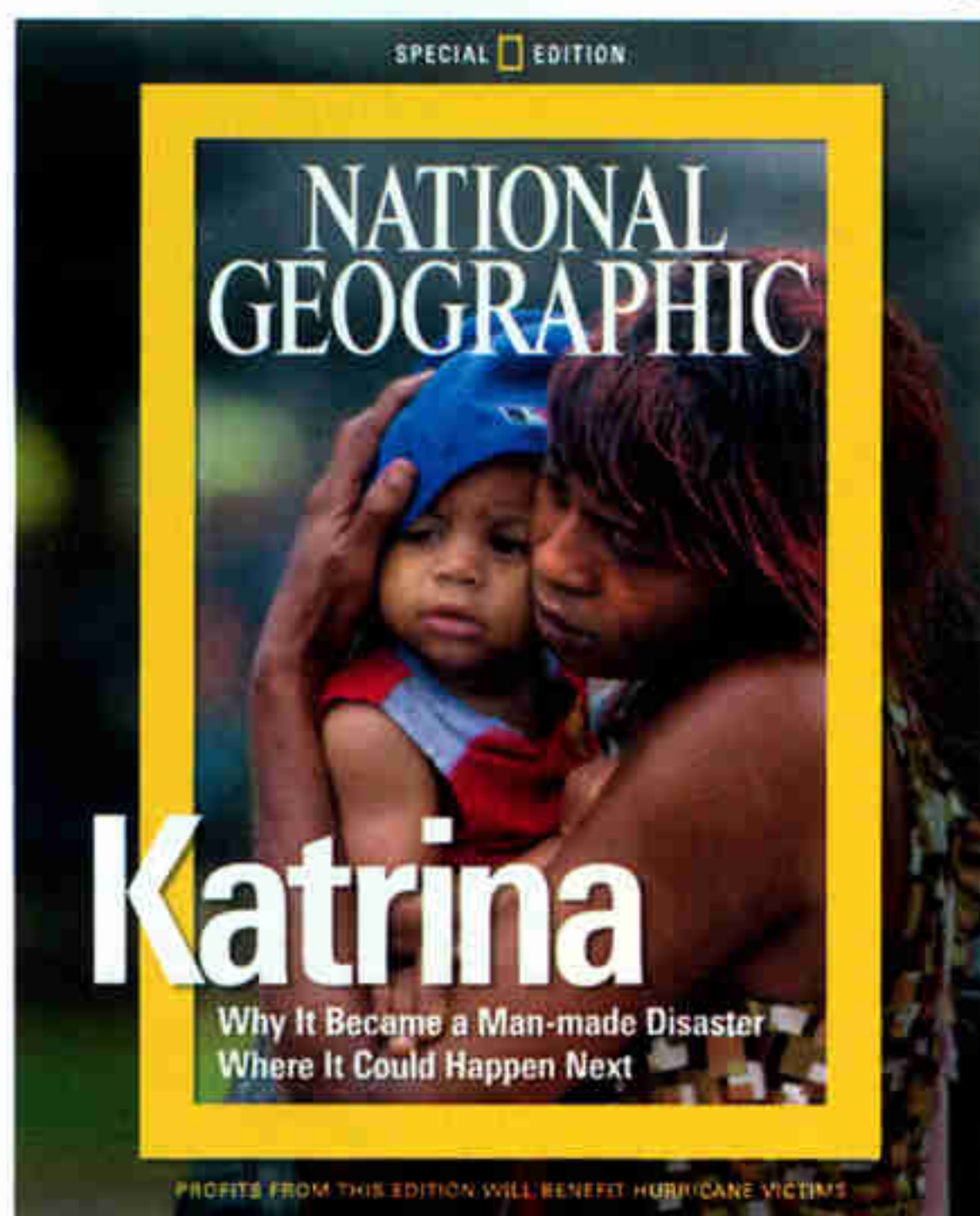
As Hurricane Katrina barreled toward the U.S. Gulf Coast in late August, a NATIONAL GEOGRAPHIC team mobilized. The magazine, which has covered many natural disasters in its 117-year history, knew well the destruction a hurricane of Katrina's magnitude could cause: An eerily accurate scenario of a drowned New Orleans was detailed in the October 2004 article on Louisiana's threatened wetlands. When reports trickled in describing the situations caused by the storm and flooding, it was clear to Editor in Chief Chris Johns that the magazine should act quickly to report on the crisis—in the form of a special issue for immediate publication. Profits would go to help storm survivors. "It was simply the right thing to do," he says. "This was the way we could help."

Illustrations editors Kurt Mutchler and Ken Geiger immediately contacted former colleagues

at the *Times-Picayune* of New Orleans and the *Dallas Morning News*. The project "snowballed from there," says senior editor Peter Miller. "A remarkable number of people agreed to collaborate for a good cause."

With each group—from other news organizations to our editorial staff to our printer QuadGraphics—contributing images, reporting, and resources, the 102-page magazine was ready in just two weeks.

The NATIONAL GEOGRAPHIC Katrina special edition (\$4.95) is available on newsstands and online. All profits from its sale will be donated to benefit hurricane victims.



BUY THE KATRINA EDITION ONLINE

and find our forum, links to hurricane coverage, and ways to help at ngm.com/katrina.

SPECIAL THANKS NATIONAL GEOGRAPHIC would like to thank the following for donating resources to make the Hurricane Katrina special edition possible: *Times-Picayune*, *Dallas Morning News*, *New York Times*, *Austin American-Statesman*, *Associated Press*, *Getty Images*, *Agence France-Presse*, *Knight Ridder/Tribune*, *Reuters*, *International Paper*, and *QuadGraphics*.

PALEONTOLOGY

Flying Monster

What did a pterosaur look like as it flew? To find out, travel back to the Cretaceous—via your television—when *Sky Monsters* premieres on the National Geographic Channel (Sunday, January 22, 9 p.m. ET/PT). Stanford University professor Margot Gerritsen and her colleagues, along with

engineer Jim Cunningham, designed a mechanized flying reptile based on 110-million-year-old pterosaur fossils discovered in Africa and Brazil. Their model (above) was slightly more than half the size of the real thing—and it still had a ten-foot wingspan. After the pterosaur was dropped by a radio-controlled plane from a height of 700 feet, Gerritsen directed its flight with another radio remote control. "We think the pterosaur was predominantly a dynamic soarer," she explains. "Flapping would have been used intermittently to gain or sustain altitude."



Calendar

DECEMBER

Enjoy free films every

Tuesday at noon, through December 13. National Geographic, Washington, D.C.

"Napoléon: An Intimate Portrait" exhibit. Learn about the life of Napoleon Bonaparte and see his treasured possessions. National Geographic Museum, Washington, D.C. Through January 2.

5 National Geographic Emerging Explorer Andrew Zolli lectures on the new longevity and its impact on the future. National Geographic, Washington, D.C. For tickets call 202-857-7700.

6 Ultimate Explorer host Lisa Ling, anthropologist Joanne Eicher, and photographer Annie Griffiths Belt discuss their book *Mother, Daughter, Sister, Bride: Rituals of Womanhood*. National Geographic, Washington, D.C.

6 Photographer Joel Sartore talks about his travels in Brazil's wild Pantanal. The Field Museum, Chicago. For tickets call 312-665-7400. Joel speaks at National Geographic in Washington, D.C., on December 7.

9 An Irish Christmas in America concert. Enjoy the songs of the traditional band Téada along with performances by other Irish musicians and dancers. National Geographic, Washington, D.C.

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CANADIAN ARCTIC

Hundreds of beluga whales pack an inlet at the north end of Somerset Island, where the fresh water of the Cunningham River mingles with the cold, salty Arctic Ocean. On July and August days the river becomes a breathtaking natural spectacle of whales nursing their young and molting—rubbing off their tired last-season skin. Their collective mass gave me the feeling I could walk over the river atop their backs, as if I were crossing a pontoon bridge to the other side. —*Norbert Rosing*

► Decorate your desktop with this image of beluga whales in an Arctic inlet, in Fun Stuff at ngm.com/0512.

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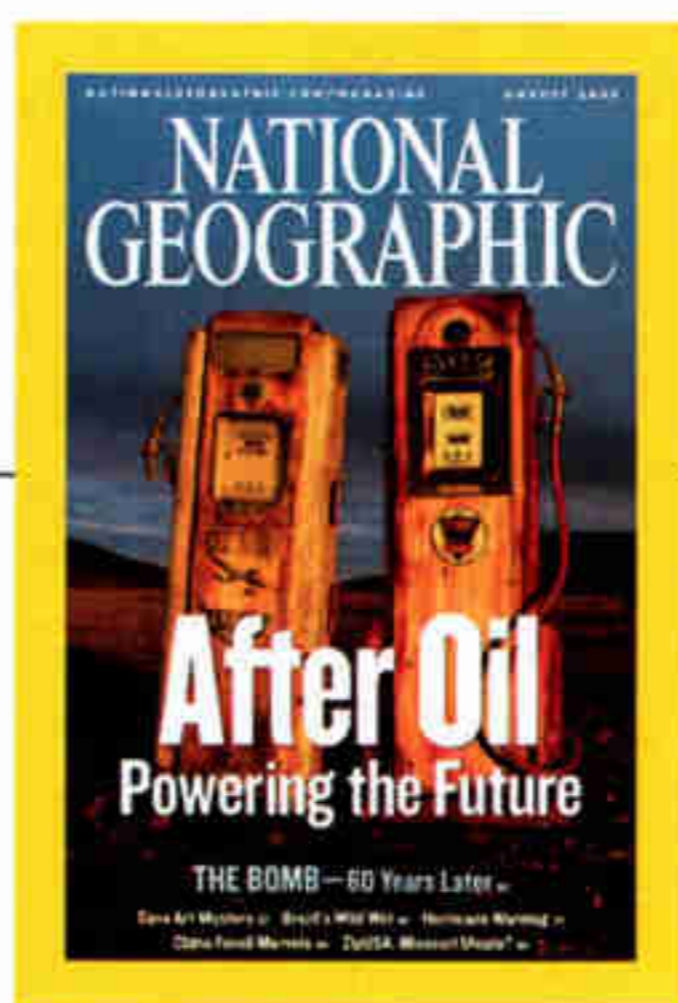
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Forum

August 2005

It was no surprise that "Powering the Future" motivated many of you to write in. Although few letters expressed opinions against alternative energy, you did debate the benefits and costs of wind and nuclear power. Some readers suggested more options, including harnessing tidal energy and other forms of hydropower. Many of you simply counseled conserving energy by using less of it.



Powering the Future

You deserve praise for the courage and foresight to publish the environmental and economic trilogy of our times: "The End of Cheap Oil," "Global Warning," and "Powering the Future." The first two articles bring public exposure to the challenges of our current energy path, while the third provides clear hope for the future. We must be similarly brave and smart enough to grab hold of the lifeboat of renewable energy and conservation as it goes floating by.

ROBERT M. FERRIS
*Community Environmental Council
Santa Barbara, California*

I was dismayed by "Hydrogen Futures" on pages 20-21. The dirty future on the left was bad enough, but the clean future on the right, with its highway full of private transport and skyscrapers full of people, only served to

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show how blinkered we can be. Where is the vision of efficient, useful public transport?

D. J. BLAKE
Blanzay, France

I cannot agree that wind power is the future. Apart from its hideous looks and the harm to flying animals, it is inefficient and does not save the production of carbon dioxide. Here in the United Kingdom, the government will spend billions of pounds in subsidies to build wind farms. To cover the periods when the wind is either too strong or weak to generate electricity, conventional generation has to remain on line. Here that means coal.

JOHN MARSHALL
Tetford, Lincolnshire

Harnessing the power of the world's oceans is well within our technological ability and would be reliable as long as the moon continues to orbit the Earth. Exposure in your magazine could help that industry immensely.

JASON DEGEORGE
Brevard, North Carolina

Our website featured a picture of a wave-power generator. To see it, go to ngm.com/0508/feature1.



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ZipUSA: Tecumseh, Missouri

I had no expectations of utopia, so when I visited East Wind and found a thriving community that takes care of its members, I was impressed rather than disappointed. It takes courage and tenacity to create an alternative society, and the members of East Wind have done that.

JANELLE RUBELEE
Raytown, Missouri

Your article on this refuge for leftover hippies was pretty depressing. The commune's rather pathetic character speaks to a group of people who have not run toward something, but from it. Each of those interviewed seemed lost on a grand journey in search of meaning and hope.

ED GEORGE
Salem, New Hampshire

I found it interesting that the East Wind article was in the same issue as "Powering the Future." Many small-scale solar, biomass, and hydro-power projects are being developed by such communities as East Wind. Your readers might be interested to know that East Wind is just one of several hundred intentional communities in



the U.S. These communities represent the whole spectrum of religion and spirituality as well.

RON MCCOLLUM
Lawndale, North Carolina

As a former member of East Wind, I believe that for many of the people living there, Alan Mairson's article was a slap in our faces. His focus on the personal difficulties and relationship issues among members of the community was viewed as disrespectful and inappropriate.

SHAWN PORTER
Murray, Arkansas

As a former nuclear submarine engineer officer, I have no problem with the idea of living close to nuclear power plants. People remember Chernobyl, but they forget the thousands of people who die every year in coal mine collapses, gas well explosions, apartment gas fires, tanker accidents, and other events directly related to fossil fuels.

ROD ADAMS
Annapolis, Maryland
FROM OUR ONLINE FORUM
ngm.com/0508

No responsible, sane individual can advocate nuclear power as a viable option. We can't pay the building costs, we can't predict where the ground will be safe from seismic activity, and we refuse to make a serious commitment to dispose of the waste. Most nuclear waste remains a hazard for 10,000 years, while recorded human history is about 5,000 years.

ALAN TRUNKEY
Seattle, Washington

Jacques Chiron says, "You don't have to drive a freaky car to use biodiesel." That's quite true. Yet inevitably, when the media write about alternative fuels, they illustrate their articles with photos of freaky-looking cars. Middle America shakes its head, mutters about weirdo hippies, and turns the page. Like it or

not, alternative fuel vehicles will never be mainstream until they are presented as ordinary vehicles used by ordinary people.

SHARI PRANGE
Felton, California

Michael Parfit did an excellent job of outlining the pros and cons of our shrinking pool of viable energy sources. However, the article is framed squarely around supply-side solutions rather than demand-side behaviors. While conceding the importance of energy efficiency, he stopped short of naming the sacred cow—overconsumption and its centrality to a consumerist economy—perhaps out of fear of jinxing a system on which we have all grown dependent.

PAUL M. MACK
Warrenville, Illinois

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I returned from conducting building damage inspections following Hurricane Dennis to appreciate your August article on the 2004 hurricanes. The timeliness has been made even more apparent by Hurricane Katrina.

The world doesn't merely have a future beyond oil, but a very bright future indeed. Renewable energy sources have the potential to supersede fossil fuels as the energy king, ensuring both a clean environment and an unlimited supply of energy. At 15, I'm confident that I'll see that wonderful switch occur during my lifetime, and I draw hope from that prospect.

NOAH KOLOGE
Newburyport, Massachusetts

Brazil's Wild Wet

I recently came back from the Pantanal, where I was working

as a teacher fellow on a conservation and geography research expedition sponsored by Earthwatch Institute and National Geographic. I wanted to commend Susan McGrath and Joel Sartore for capturing the true image and culture of the magical place. This article painted a vivid picture in my mind, as if I had never left the Pantanal.

NOEL SMITH
Salem, New Jersey

Hurricane Warning

I returned from conducting building damage inspections following Hurricane Dennis to

appreciate your August article on the 2004 hurricanes. The timeliness has been made even more apparent by Hurricane Katrina.

SPENCER ROGERS
Wilmington, North Carolina

In addition to this issue's article on aid efforts in the Gulf states, learn more about Hurricane Katrina in our special issue now on newsstands, and at ngm.com/katrina, with links to past articles, relief agencies, and an online forum.

China's Fossil Marvels

I've helped NATIONAL GEOGRAPHIC fact-checkers in the past, so I know how obsessive they can be about catching errors. But one slipped through. The "bee" with the long proboscis on page 90 is actually a fly (family Nemestrinidae) and the earliest

Remember
measles?

Remember
rubella?

known specialized pollinator. It seems that flies never really get the respect they deserve.

DAVID GRIMALDI
*Curator, Invertebrate Zoology
American Museum of Natural History
New York, New York*

Who Knew?

Imagine my shock in reading your article playing off the word crazy. First your cat could make you crazy, then cats can act a little crazy, and then the author slid into the information that a cat's fecal material may carry a protozoan that can cause schizophrenia. Hence, someone with schizophrenia is crazy. For the past hundred years advocates for mental health have worked long and hard to eliminate misconceptions, prejudice, and misinformation on psychiatric illnesses. Please do not encourage your readership to link "going

crazy" with this extremely serious and potentially debilitating illness.

KATE GASTON
*Mental Health Association in Greensboro
Greensboro, North Carolina*

Cats can help the mentally ill by providing unconditional love and giving them a sense of responsibility. Cats can be beneficial to our health, as simply stroking them can relieve stress and lessen the pain of a headache, and they provide companionship for the elderly.

LAURIE-ANN GAUVREAU
St.-Omer, Quebec

Authorities on toxoplasmosis believe more people are infected with *Toxoplasma* after eating meat containing tissue cysts or being exposed to the parasite through ingestion of soil that contains infectious parasite eggs (mostly from fruit and

vegetables) than by direct association with cats.

HENRY CHILDERS
*President, American Veterinary
Medical Association
Schaumburg, Illinois*

Flashback

I have to express a history teacher's pet peeve with regard to your Flashback. In it you talk about a Ford automobile in 1953 and make the astounding claim that gas was only 29 cents a gallon. But accounting for inflation, 29 cents in 1953 is worth about two dollars at today's prices.

DAVID A. SENECHAL
Chicago, Illinois

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GEOGR

T H E P E O P L E , P L A C E S , A N D



Mending tsunami damage, divers cement a sea fan into place near Thailand's Similan Islands, where waves snapped off hundreds of the fans. The hope: that reattached corals will survive. Otherwise it could take decades for new ones to grow.

DAVID DOUBILET

AFRICA

CREATURES OF OUR UNIVERSE

CONSERVATION

After the Tsunami

A team of scientist-divers predicts quick recovery for most reefs pounded by last year's killer waves

When a submarine earthquake sent monster waves surging through the Indian Ocean and Andaman Sea last December 26, there was no mistaking the toll on land: more than 225,000 people dead; homes, farms, fishing boats destroyed. Three and a half months later I joined seven other biologists and set off on a two-week research cruise along the coast of Thailand to survey a

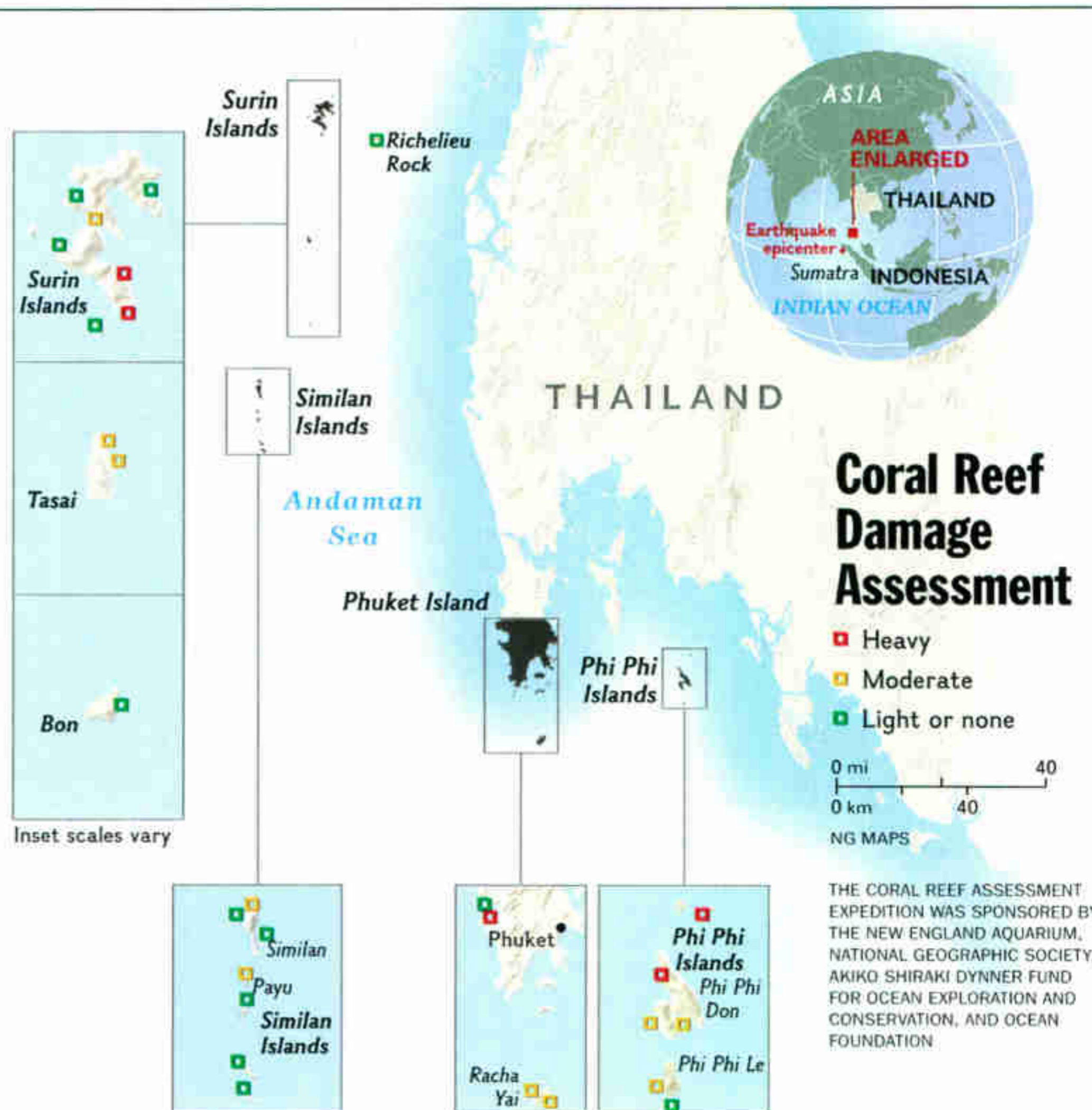
less obvious toll—the damage to the coral reefs. Priceless for their biological diversity, Thailand's reefs are a lifeline for hundreds of thousands of people who catch fish spawned there or work in the dive-tourism industry. In some places the reefs may also have helped blunt the tsunami's force as it hit land.

After more than 500 dives at 56 sites, we found plenty of damage but even more reason for

optimism. In the open ocean the tsunami's fast-moving waves were only a few feet high and posed little hazard to deepwater reefs. But in the shallows they slowed, piled up, and unleashed thousands of tons of force. Large bays, which can intensify the waves, were hit especially hard, with table corals big enough for a family dinner scattered and broken, and massive coral heads toppled and smothered in silt.

Development on shore often worsened the damage by providing an ample supply of debris, including refrigerators, cars, and roofing, which battered the reefs as it was swept out to sea. And near the earthquake's epicenter off Indonesia—far from our survey—the seafloor was heaved up by an estimated 16 feet, lifting some coral clear out of the water.

Overall, though, our survey of the Andaman Sea coast and islands of southern Thailand (map) revealed very light damage or none at all at 36 percent of the study sites and moderate damage at another 50 percent. Only 14 percent had severe damage. Except for localized kills, reef fish also seemed to have fared well. "The tsunami shook up their world like mad for a few



minutes, but there are still plenty of fish around," concluded fish expert Gerry Allen of the Western Australian Museum.

Much of the damage will heal quickly, re-creating vibrant habitats. Broken and toppled coral can continue to grow. Even dead reefs can recover, providing they haven't been buried, as coral larvae drift in and recolonize them.

We also saw efforts to speed the recovery. In the Similan Islands the tsunami dislodged hundreds of delicate, decades-old sea fans, dooming them to drift around and eventually die. We watched divers in a project led by the Phuket Marine Biological Center swimming in pairs, holding six-foot sea fans between them like chandeliers and reattaching them to rocks using masonry nails and cement.

The project is a rare case of humans affecting reefs for the better. Throughout our survey we saw the opposite—the effects of overfishing, development, and global warming, which can raise water temperatures and cause fatal coral bleaching. "For reefs, in the fullness of time, this tsunami was just another bad day," says Australian coral expert Charlie Veron. But human impacts are unrelenting, and reefs may not be able to shrug them off so easily.

—Greg Stone

NEW ENGLAND AQUARIUM



Uplifted more than five feet by the undersea earthquake that spawned the tsunami, dead coral reefs span 70 miles of coast off Simeulue Island near Sumatra, Indonesia.

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As a child, C. S. Lewis told his brother stories while playing in a wardrobe (left) now at Wheaton College. Another Lewis family wardrobe at Westmont College (above) has a "looking-glass" door like the one described in *The Lion, the Witch and the Wardrobe*.

CULTURE

Witch Wardrobe Inspired Narnia?

Two colleges look into C. S. Lewis's closets to find out

In *The Lion, the Witch and the Wardrobe*, the first published volume of C. S. Lewis's *Chronicles of Narnia*, children step through a "perfectly ordinary wardrobe" into an enchanted world. Lewis's compelling stories later prompted two Christian colleges in the U.S.—Westmont in California and Wheaton in Illinois—to acquire two different wardrobes once owned by the British writer. Whether either was the piece of furniture that inspired Lewis remains a mystery.

Wheaton College's wardrobe, carved by Lewis's grandfather, was a family heirloom. "People are allowed to touch it," explains

the school's Marjorie Mead, "but not climb into it—for obvious reasons." Wheaton acquired the piece in 1973, along with many personal papers of the author.

Aside from its wardrobe, Westmont College has no other Lewis memorabilia. "We can't claim that this wardrobe inspired Lewis," admits English professor Paul Delaney. "But it does match the description in the book."

This much is certain: 55 years after the story was published, the idea of a magic closet still enchants. "We all want to climb into a wardrobe and find ourselves in another world," says Westmont's Nancy Phinney. —Cate Lineberry

HEALTH

■ **Olive oil contains a natural painkiller**, scientists say. An ingredient in olives known as oleocanthal works in much the same way as the drug ibuprofen to suppress pain-causing prostaglandins in the body. The anti-inflammatory properties of oleocanthal may help explain the reduced incidence of certain cancers, stroke, and heart disease in Mediterranean populations that traditionally use large amounts of olive oil in their diets.

CONSERVATION

■ **The largest marine protected area in the United States has been designated in the North Pacific.** The Aleutian Islands Habitat Conservation Area encompasses nearly 377,000 square miles of ocean and will be off-limits to trawling and other commercial seafloor fishing methods. Fishing-industry groups, conservation organizations, and local communities worked together with the federal government to establish guidelines for protection of fish and other animal populations, rare coral gardens, and seamount habitat areas in the new preserve.

ANIMAL KINGDOM

■ **Cats can't taste sugary foods.** A defective sweet-receptor gene is why, according to a new study. This antipathy toward sweets may have helped shape feline evolution in the wild, leading to a preference for muscle-building protein over carbohydrates. Or, say scientists, the gene may have become defective from lack of use in cats' high-protein diet.



EMERGING EXPLORER JENNY DALTRY Wading unexplored rivers and swamps, Jenny Daltry works to save the world's most critically endangered reptiles and amphibians. Her biological insights and conservation strategies are transforming prospects for Siamese crocodiles in Cambodia, Antigua racer snakes in the West Indies, and other species on the verge of vanishing. Braving landscapes laced with land mines, erupting volcanoes, and venomous snakes, Jenny explores the remote to preserve the rare.

Start something wild

"BEING THE FIRST SCIENTIST TO SEE A PARTICULAR RIVER or identify a new species is a real adventure. The health of wildlife and humans depends upon conserving natural areas and the species that maintain the ecosystem. Since snakes and crocodiles aren't everyone's favorites, they have a special need for attention. Often, it's humans who have pushed these creatures to the edge of extinction. So nothing is more satisfying than seeing my explorations lead to successful conservation programs that involve and benefit local people."

Jenny Daltry, Herpetologist and Conservation Biologist



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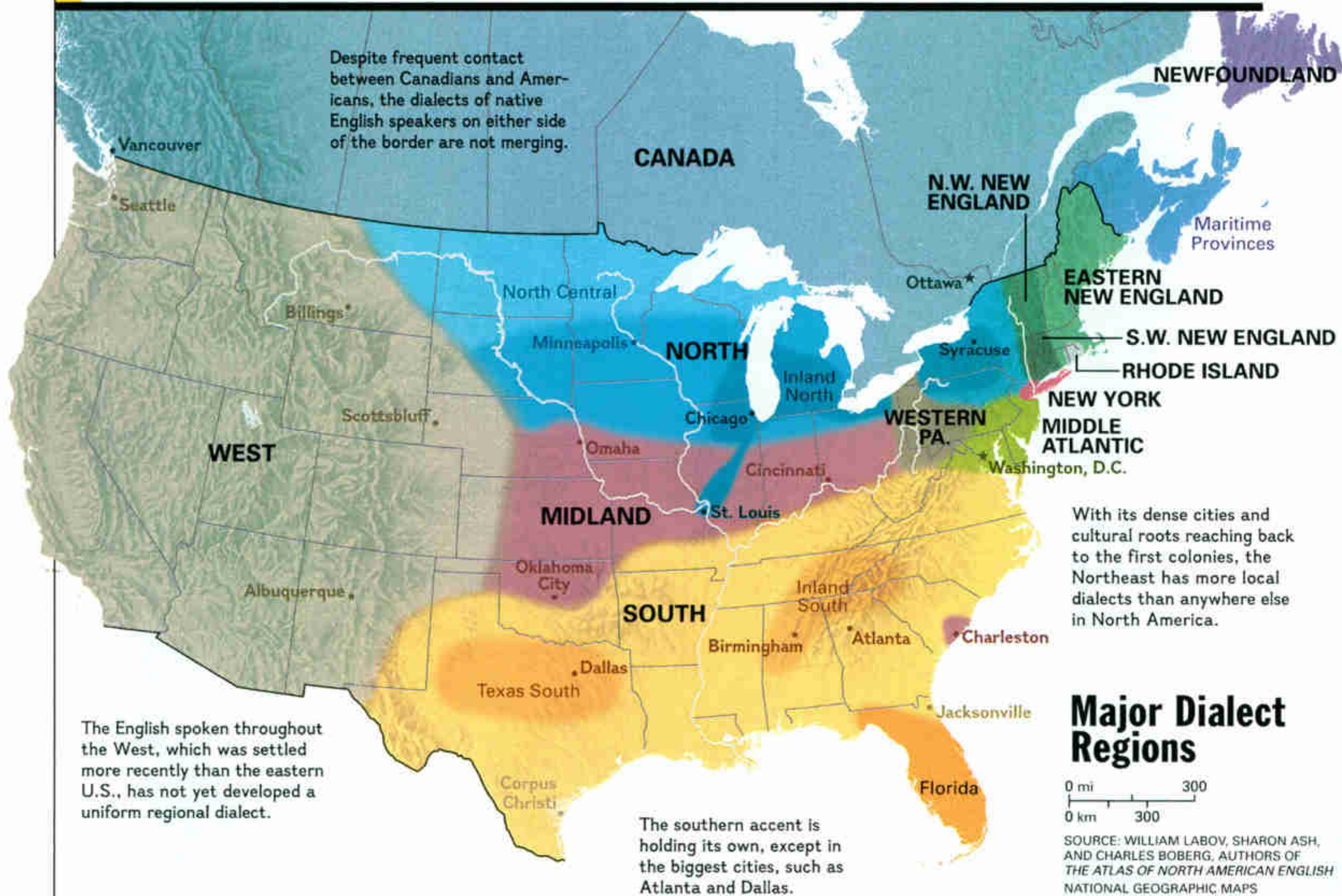
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GEOGRAPHY OF EVERYDAY LIFE



North American Dialects

Far from fading away, they're getting more pronounced

Read these words aloud: caught and cot; pin and pen. Do the pairs sound the same? Your answers depend on where you're from. That's because even though most Americans and Canadians speak English, they don't all speak the same English.

The different dialects developed from the various groups that immigrated to the continent generations ago. Until recently, notes University of Pennsylvania linguist Bill Labov, many experts assumed that "under the influence of universal literacy and mass

media, regional dialects were being leveled."

Not so: Local identity and other social forces exert a stronger influence than even TV on how dialects evolve. "The Inland North, the Midland, Canada, and the South are now more different from each other than ever," says Labov, who directed a long-running study on American dialects. The findings will be published this month in *The Atlas of North American English*, which he wrote with Charles Boberg and Sharon Ash.

In each region the study found major sound changes in progress. In the North, for instance, vowels

are shifting so that the *o* in "stock" sounds more like the *a* in "back." Just across the border in Canada, the exact opposite shift is occurring. The changes and intensification of dialects aren't unique to North America. Labov observes that in England and Europe "long-established regional dialects are also getting stronger."

So where are you on the map? If your pens sound like pins, then you're probably from the South. But if "cot" and "caught" sound alike, you may be from eastern New England, western Pennsylvania, the West, Canada—or Scotland. —Naomi Schwarz

When it comes to bad cholesterol— Ask your doctor if lower is better.

Getting high cholesterol down is important.

Doctors know lowering high cholesterol is important for everyone. But for some people, it's even more important. In fact, a panel of medical experts recently proposed updated guidelines suggesting many patients aim for an even lower cholesterol goal than before.*

Working with your doctor is key to helping you reach your cholesterol goal.

If, after all you've tried—including diet and exercise—your doctor believes you need to get your bad cholesterol even lower, ask whether CRESTOR might help.

Aim lower.

CRESTOR may make the difference you need. In fact, the 10-mg dose of CRESTOR, along with diet, can lower bad cholesterol by as much as 52% (vs 7% with placebo). That means your LDL-C—the bad cholesterol—could go down about half. Your results may vary.

Is CRESTOR right for you?

That's another conversation you need to have with your doctor. Your doctor will decide the best course of treatment for you after assessing your particular needs.

Get more information about CRESTOR.

To learn more about CRESTOR, or if you are without prescription coverage and can't afford your medication, AstraZeneca may be able to help. Call 800-CRESTOR or visit CRESTOR.com.

Here is important safety information about CRESTOR you need to know.

CRESTOR is prescribed along with diet for lowering high cholesterol and has not been determined to prevent heart disease, heart attacks, or strokes. CRESTOR is not right for everyone, including women who are nursing, pregnant, or who may become pregnant, or anyone with liver problems. Your doctor will do blood tests before and during treatment with CRESTOR to monitor your liver function. Unexplained muscle pain and weakness could be a sign of a rare but serious side effect and should be reported to your doctor right away. The 40-mg dose of CRESTOR is only for patients who do not reach goal on 20 mg. Be sure to tell your doctor if you are taking any medications. Side effects occur infrequently and include muscle aches, constipation, weakness, abdominal pain, and nausea. They are usually mild and tend to go away.

If your doctor says,
"lower is better," aim lower with CRESTOR.



CRESTOR[®]
rosuvastatin calcium

*Adult Treatment Panel (ATP) III, Update, 2004

Please read the important Product Information about CRESTOR on the adjacent page and discuss it with your doctor.

AstraZeneca 

Please read this summary carefully and then ask your doctor about CRESTOR. No advertisement can provide all the information needed to determine if a drug is right for you. This advertisement does not take the place of careful discussions with your doctor. Only your doctor has the training to weigh the risks and benefits of a prescription drug.



BRIEF SUMMARY: For full Prescribing Information, see package insert. **INDICATIONS AND USAGE** CRESTOR is indicated: 1. as an adjunct to diet to reduce elevated total-C, LDL-C, ApoB, nonHDL-C, and TG levels and to increase HDL-C in patients with primary hypercholesterolemia (heterozygous familial and nonfamilial) and mixed dyslipidemia (Fredrickson Type IIa and IIb); 2. as an adjunct to diet for the treatment of patients with elevated serum TG levels (Fredrickson Type IV); 3. to reduce LDL-C, total-C, and ApoB in patients with homozygous familial hypercholesterolemia as an adjunct to other lipid-lowering treatments (e.g., LDL apheresis) or if such treatments are unavailable. **CONTRAINDICATIONS** CRESTOR is contraindicated in patients with a known hypersensitivity to any component of this product. Rosuvastatin is contraindicated in patients with active liver disease or with unexplained persistent elevations of serum transaminases (see WARNINGS, Liver Enzymes). **Pregnancy and Lactation** Atherosclerosis is a chronic process and discontinuation of lipid-lowering drugs during pregnancy should have little impact on the outcome of long-term therapy of primary hypercholesterolemia. Cholesterol and other products of cholesterol biosynthesis are essential components for fetal development (including synthesis of steroids and cell membranes). Since HMG-CoA reductase inhibitors decrease cholesterol synthesis and possibly the synthesis of other biologically active substances derived from cholesterol, they may cause fetal harm when administered to pregnant women. Therefore, HMG-CoA reductase inhibitors are contraindicated during pregnancy and in nursing mothers. ROSUVASTATIN SHOULD BE ADMINISTERED TO WOMEN OF CHILDBEARING AGE ONLY WHEN SUCH PATIENTS ARE HIGHLY UNLIKELY TO CONCEIVE AND HAVE BEEN INFORMED OF THE POTENTIAL HAZARDS. If the patient becomes pregnant while taking this drug, therapy should be discontinued immediately and the patient apprised of the potential hazard to the fetus. **WARNINGS Liver Enzymes** HMG-CoA reductase inhibitors, like some other lipid-lowering therapies, have been associated with biochemical abnormalities of liver function. The incidence of persistent elevations (>3 times the upper limit of normal [ULN] occurring on 2 or more consecutive occasions) in serum transaminases in fixed dose studies was 0.4, 0, 0, and 0.1% in patients who received rosuvastatin 5, 10, 20, and 40 mg, respectively. In most cases, the elevations were transient and resolved or improved on continued therapy or after a brief interruption in therapy. There were two cases of jaundice, for which a relationship to rosuvastatin therapy could not be determined, which resolved after discontinuation of therapy. There were no cases of liver failure or irreversible liver disease in these trials. **It is recommended that liver function tests be performed before and at 12 weeks following both the initiation of therapy and any elevation of dose, and periodically (e.g., semiannually) thereafter.** Liver enzyme changes generally occur in the first 3 months of treatment with rosuvastatin. Patients who develop increased transaminase levels should be monitored until the abnormalities have resolved. Should an increase in ALT or AST of >3 times ULN persist, reduction of dose or withdrawal of rosuvastatin is recommended. Rosuvastatin should be used with caution in patients who consume substantial quantities of alcohol and/or have a history of liver disease (see CLINICAL PHARMACOLOGY, Special Populations, Hepatic Insufficiency). Active liver disease or unexplained persistent transaminase elevations are contraindications to the use of rosuvastatin (see CONTRAINDICATIONS). **Myopathy/Rhabdomyolysis** Rare cases of rhabdomyolysis with acute renal failure secondary to myoglobinuria have been reported with rosuvastatin and with other drugs in this class. Uncomplicated myalgia has been reported in rosuvastatin-treated patients (see ADVERSE REACTIONS). Creatine kinase (CK) elevations (>10 times upper limit of normal) occurred in 0.2% to 0.4% of patients taking rosuvastatin at doses up to 40 mg in clinical studies. Treatment-related myopathy, defined as muscle aches or muscle weakness in conjunction with increases in CK values >10 times upper limit of normal, was reported in up to 0.1% of patients taking rosuvastatin doses of up to 40 mg in clinical studies. In clinical trials, the incidence of myopathy and rhabdomyolysis increased at doses of rosuvastatin above the recommended dosage range (5 to 40 mg). In postmarketing experience, effects on skeletal muscle, e.g., uncomplicated myalgia, myopathy and, rarely, rhabdomyolysis have been reported in patients treated with HMG-CoA reductase inhibitors including rosuvastatin. As with other HMG-CoA reductase inhibitors, reports of rhabdomyolysis with rosuvastatin are rare, but higher at the highest marketed dose (40 mg). Factors that may predispose patients to myopathy with HMG-CoA reductase inhibitors include advanced age (≥ 65 years), hypothyroidism, and renal insufficiency. Consequently: 1. Rosuvastatin should be prescribed with caution in patients with predisposing factors for myopathy, such as, renal impairment (see DOSAGE AND ADMINISTRATION), advanced age, and inadequately treated hypothyroidism. 2. Patients should be advised to promptly report unexplained muscle pain, tenderness, or weakness, particularly if accompanied by malaise or fever. Rosuvastatin therapy should be discontinued if markedly elevated CK levels occur or myopathy is diagnosed or suspected. 3. The 40 mg dose of rosuvastatin is reserved only for those patients who have not achieved their LDL-C goal utilizing the 20 mg dose of rosuvastatin once daily (see DOSAGE AND ADMINISTRATION). 4. The risk of myopathy during treatment with rosuvastatin may be increased with concurrent administration of other lipid-lowering therapies or cyclosporine. (see CLINICAL PHARMACOLOGY, Drug Interactions, PRECAUTIONS, Drug Interactions, and DOSAGE AND ADMINISTRATION). **The benefit of further alterations in lipid levels by the combined use of rosuvastatin with fibrates or niacin should be carefully weighed against the potential risks of this combination. Combination therapy with rosuvastatin and gemfibrozil should generally be avoided. (See DOSAGE AND ADMINISTRATION and PRECAUTIONS, Drug Interactions).** 5. **The risk of myopathy during treatment with rosuvastatin may be increased in circumstances which increase rosuvastatin drug levels (see CLINICAL PHARMACOLOGY, Special Populations, Race and Renal Insufficiency, and PRECAUTIONS, General).** 6. Rosuvastatin therapy should also be temporarily withheld in any patient with an acute, serious condition suggestive of myopathy or predisposing to the development of renal failure secondary to rhabdomyolysis (e.g., sepsis, hypotension, dehydration, major surgery, trauma, severe metabolic, endocrine, and electrolyte disorders, or uncontrolled seizures). **PRECAUTIONS General** Before instituting therapy with rosuvastatin, an attempt should be made to control hypercholesterolemia with appropriate diet and exercise, weight reduction in obese patients, and treatment of underlying medical problems (see INDICATIONS AND USAGE). Administration of rosuvastatin 20 mg to patients with severe renal impairment ($CL_{CR} < 30$ mL/min/1.73 m²) resulted in a 3-fold increase in plasma concentrations of rosuvastatin compared with healthy volunteers (see WARNINGS, Myopathy/Rhabdomyolysis and DOSAGE AND ADMINISTRATION). The result of a large pharmacokinetic study conducted in the US demonstrated an approximate 2-fold elevation in median exposure in Asian subjects (having either Filipino, Chinese, Japanese, Korean, Vietnamese or Asian-Indian origin) compared with a Caucasian control group. This increase should be considered when making rosuvastatin dosing decisions for Asian patients. (See WARNINGS, Myopathy/Rhabdomyolysis; CLINICAL PHARMACOLOGY, Special Populations, Race, and DOSAGE AND ADMINISTRATION.) **Information for Patients** Patients should be advised to report promptly unexplained muscle pain, tenderness, or weakness, particularly if accompanied by malaise or fever. When taking rosuvastatin with an aluminum and magnesium hydroxide combination antacid, the antacid should be taken at least 2 hours after rosuvastatin administration (see CLINICAL PHARMACOLOGY, Drug

Interactions). **Laboratory Tests** In the rosuvastatin clinical trial program, dipstick-positive proteinuria and microscopic hematuria were observed among rosuvastatin-treated patients, predominantly in patients dosed above the recommended dose range (i.e., 80 mg). However, this finding was more frequent in patients taking rosuvastatin 40 mg, when compared to lower doses of rosuvastatin or comparator statins, though it was generally transient and was not associated with worsening renal function. Although the clinical significance of this finding is unknown, a dose reduction should be considered for patients on rosuvastatin 40 mg therapy with unexplained persistent proteinuria during routine urinalysis testing. **Drug Interactions Cyclosporine:** When rosuvastatin 10 mg was coadministered with cyclosporine in cardiac transplant patients, rosuvastatin mean C_{max} and mean AUC were increased 11-fold and 7-fold, respectively, compared with healthy volunteers. These increases are considered to be clinically significant and require special consideration in the dosing of rosuvastatin to patients taking concomitant cyclosporine (see WARNINGS, Myopathy/Rhabdomyolysis, and DOSAGE AND ADMINISTRATION). **Warfarin:** Coadministration of rosuvastatin to patients on stable warfarin therapy resulted in clinically significant rises in INR (>4 , baseline 2-3). In patients taking coumarin anticoagulants and rosuvastatin concomitantly, INR should be determined before starting rosuvastatin and frequently enough during early therapy to ensure that no significant alteration of INR occurs. Once a stable INR time has been documented, INR can be monitored at the intervals usually recommended for patients on coumarin anticoagulants. If the dose of rosuvastatin is changed, the same procedure should be repeated. Rosuvastatin therapy has not been associated with bleeding or with changes in INR in patients not taking anticoagulants. **Gemfibrozil:** Coadministration of a single rosuvastatin dose to healthy volunteers on gemfibrozil (600 mg twice daily) resulted in a 2.2- and 1.9-fold, respectively, increase in mean C_{max} and mean AUC of rosuvastatin (see DOSAGE AND ADMINISTRATION). **Endocrine Function** Although clinical studies have shown that rosuvastatin alone does not reduce basal plasma cortisol concentration or impair adrenal reserve, caution should be exercised if any HMG-CoA reductase inhibitor or other agent used to lower cholesterol levels is administered concomitantly with drugs that may decrease the levels or activity of endogenous steroid hormones such as ketoconazole, spironolactone, and cimetidine. **CNS Toxicity** CNS vascular lesions, characterized by perivascular hemorrhages, edema, and mononuclear cell infiltration of perivascular spaces, have been observed in dogs treated with several other members of this drug class. A chemically similar drug in this class produced dose-dependent optic nerve degeneration (Wallerian degeneration of retinogeniculate fibers) in dogs, at a dose that produced plasma drug levels about 30 times higher than the mean drug level in humans taking the highest recommended dose. Edema, hemorrhage, and partial necrosis in the interstitium of the choroid plexus was observed in a female dog sacrificed moribund at day 24 at 90 mg/kg/day by oral gavage (systemic exposures 100 times the human exposure at 40 mg/day based on AUC comparisons). Corneal opacity was seen in dogs treated for 52 weeks at 6 mg/kg/day by oral gavage (systemic exposures 20 times the human exposure at 40 mg/day based on AUC comparisons). Cataracts were seen in dogs treated for 12 weeks by oral gavage at 30 mg/kg/day (systemic exposures 60 times the human exposure at 40 mg/day based on AUC comparisons). Retinal dysplasia and retinal loss were seen in dogs treated for 4 weeks by oral gavage at 90 mg/kg/day (systemic exposures 100 times the human exposure at 40 mg/day based on AUC). Doses ≤ 30 mg/kg/day (systemic exposures ≤ 60 times the human exposure at 40 mg/day based on AUC comparisons) following treatment up to one year, did not reveal retinal findings. **Carcinogenesis, Mutagenesis, Impairment of Fertility** In a 104-week carcinogenicity study in rats at dose levels of 2, 20, 60, or 80 mg/kg/day by oral gavage, the incidence of uterine stromal polyps was significantly increased in females at 80 mg/kg/day at systemic exposure 20 times the human exposure at 40 mg/day based on AUC. Increased incidence of polyps was not seen at lower doses. In a 107-week carcinogenicity study in mice given 10, 60, 200 mg/kg/day by oral gavage, an increased incidence of hepatocellular adenoma/carcinoma was observed at 200 mg/kg/day at systemic exposures 20 times human exposure at 40 mg/day based on AUC. An increased incidence of hepatocellular tumors was not seen at lower doses. Rosuvastatin was not mutagenic or clastogenic with or without metabolic activation in the Ames test with *Salmonella typhimurium* and *Escherichia coli*, the mouse lymphoma assay, and the chromosomal aberration assay in Chinese hamster lung cells. Rosuvastatin was negative in the *in vivo* mouse micronucleus test. In rat fertility studies with oral gavage doses of 5, 15, 50 mg/kg/day, males were treated for 9 weeks prior to and throughout mating and females were treated 2 weeks prior to mating and throughout mating until gestation day 7. No adverse effect on fertility was observed at 50 mg/kg/day (systemic exposures up to 10 times human exposure at 40 mg/day based on AUC comparisons). In testicles of dogs treated with rosuvastatin at 30 mg/kg/day for one month, spermatidic giant cells were seen. Spermatidic giant cells were observed in monkeys after 6-month treatment at 30 mg/kg/day in addition to vacuolation of seminiferous tubular epithelium. Exposures in the dog were 20 times and in the monkey 10 times human exposure at 40 mg/day based on body surface area comparisons. Similar findings have been seen with other drugs in this class. **Pregnancy Pregnancy Category X** See CONTRAINDICATIONS. Rosuvastatin may cause fetal harm when administered to a pregnant woman. Rosuvastatin is contraindicated in women who are or may become pregnant. Safety in pregnant women has not been established. There are no adequate and well-controlled studies of rosuvastatin in pregnant women. Rosuvastatin crosses the placenta and is found in fetal tissue and amniotic fluid at 3% and 20%, respectively, of the maternal plasma concentration following a single 25 mg/kg oral gavage dose on gestation day 16 in rats. A higher fetal tissue distribution (25% maternal plasma concentration) was observed in rabbits after a single oral gavage dose of 1 mg/kg on gestation day 18. If this drug is administered to a woman with reproductive potential, the patient should be apprised of the potential hazard to a fetus. In female rats given oral gavage doses of 5, 15, 50 mg/kg/day rosuvastatin before mating and continuing through day 7 postcoitus results in decreased fetal body weight (female pups) and delayed ossification at the high dose (systemic exposures 10 times human exposure at 40 mg/day based on AUC comparisons). In pregnant rats given oral gavage doses of 2, 20, 50 mg/kg/day from gestation day 7 through lactation day 21 (weaning), decreased pup survival occurred in groups given 50 mg/kg/day, systemic exposures ≥ 12 times human exposure at 40 mg/day based on body surface area comparisons. In pregnant rabbits given oral gavage doses of 0.3, 1, 3 mg/kg/day from gestation day 6 to lactation day 18 (weaning), exposures equivalent to human exposure at 40 mg/day based on body surface area comparisons, decreased fetal viability and maternal mortality was observed. Rosuvastatin was not teratogenic in rats at ≤ 25 mg/kg/day or in rabbits ≤ 3 mg/kg/day (systemic exposures equivalent to human exposure at 40 mg/day based on AUC or body surface comparison, respectively). **Nursing Mothers** It is not known whether rosuvastatin is excreted in human milk. Studies in lactating rats have demonstrated that rosuvastatin is secreted into breast milk at levels 3 times higher than that obtained in the plasma following oral gavage dosing. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from rosuvastatin, a decision should be made whether to discontinue nursing or administration of rosuvastatin taking into account the importance of the drug to the lactating woman. **Pediatric Use** The safety and effectiveness in pediatric patients have not been established. Treatment experience with rosuvastatin in a pediatric population is limited to 8 patients with homozygous FH. None of these patients was below 8 years of age. **Geriatric Use** Of the 10,275 patients in clinical studies with rosuvastatin, 3,159 (31%) were 65 years and older, and 698 (6.8%) were 75 years and older. The overall frequency of adverse events and types of adverse events were similar in patients above and below 65 years of age. (See WARNINGS, Myopathy/Rhabdomyolysis.) The efficacy of rosuvastatin in the geriatric population (≥ 65 years of age) was comparable to the efficacy observed in the non-elderly. **ADVERSE REACTIONS** Rosuvastatin is generally well tolerated. Adverse reactions have usually been mild and transient. In clinical studies of 10,275 patients, 3.7% were discontinued due to adverse experiences attributable to rosuvastatin. The most frequent adverse events thought to be related to rosuvastatin were myalgia, constipation, asthenia, abdominal pain, and nausea. **Clinical Adverse Experiences** Adverse experiences, regardless of causality assessment, reported in $\geq 2\%$ of patients in placebo-controlled clinical studies of rosuvastatin are shown in Table 1; discontinuations due to adverse events in these studies of up to 12 weeks duration occurred in 3% of patients on rosuvastatin and 5% on placebo.

Table 1. Adverse Events in Placebo-Controlled Studies

Adverse event	Rosuvastatin N=744	Placebo N=382
Pharyngitis	9.0	7.6
Headache	5.5	5.0
Diarrhea	3.4	2.9
Dyspepsia	3.4	3.1
Nausea	3.4	3.1
Myalgia	2.8	1.3
Asthenia	2.7	2.6
Back pain	2.6	2.4
Flu syndrome	2.3	1.8
Urinary tract infection	2.3	1.6
Rhinitis	2.2	2.1
Sinusitis	2.0	1.8

In addition, the following adverse events were reported, regardless of causality assessment, in $\geq 1\%$ of 10,275 patients treated with rosuvastatin in clinical studies. The events in *italics* occurred in $\geq 2\%$ of these patients. **Body as a Whole:** *Abdominal pain, accidental injury, chest pain, infection, pain, pelvic pain, and neck pain.* **Cardiovascular System:** *Hypertension, angina pectoris, vasodilatation, and palpitation.* **Digestive System:** *Constipation, gastroenteritis, vomiting, flatulence, periodontal abscess, and gastritis.* **Endocrine:** Diabetes mellitus. **Hemic and Lymphatic System:** Anemia and ecchymosis. **Metabolic and Nutritional Disorders:** *Peripheral edema.* **Musculoskeletal System:** *Arthritis, arthralgia, and pathological fracture.* **Nervous System:** *Dizziness, insomnia, hypertension, paresthesia, depression, anxiety, vertigo, and neuralgia.* **Respiratory System:** *Branchitis, cough increased, dyspnea, pneumonia, and asthma.* **Skin and Appendages:** *Rash and pruritus.* **Laboratory Abnormalities:** In the rosuvastatin clinical trial program, dipstick-positive proteinuria and microscopic hematuria were observed among rosuvastatin-treated patients, predominantly in patients dosed above the recommended dose range (i.e., 80 mg). However, this finding was more frequent in patients taking rosuvastatin 40 mg, when compared to lower doses of rosuvastatin or comparator statins, though it was generally transient and was not associated with worsening renal function. (See PRECAUTIONS, Laboratory Tests.) Other abnormal laboratory values reported were elevated creatinine phosphokinase, transaminases, hyperglycemia, glutamyl transpeptidase, alkaline phosphatase, bilirubin, and thyroid function abnormalities. Other adverse events reported less frequently than 1% in the rosuvastatin clinical study program, regardless of causality assessment, included arrhythmia, hepatitis, hypersensitivity reactions (i.e., face edema, thrombocytopenia, leukopenia, vesiculobullous rash, urticaria, and angioedema), kidney failure, syncope, myasthenia, myositis, pancreatitis, photosensitivity reaction, myopathy, and rhabdomyolysis. **Postmarketing Experience** In addition to the events reported above, as with other drugs in this class, the following event has been reported during post-marketing experience with CRESTOR, regardless of causality assessment: very rare cases of jaundice. **OVERDOSAGE** There is no specific treatment in the event of overdose. In the event of overdose, the patient should be treated symptomatically and supportive measures instituted as required. Hemodialysis does not significantly enhance clearance of rosuvastatin. **DOSAGE AND ADMINISTRATION** The patient should be placed on a standard cholesterol-lowering diet before receiving CRESTOR and should continue on this diet during treatment. CRESTOR can be administered as a single dose at any time of day, with or without food. **Hypercholesterolemia (Heterozygous Familial and Nonfamilial) and Mixed Dyslipidemia (Fredrickson Type IIa and IIb)** The dose range for CRESTOR is 5 to 40 mg once daily. Therapy with CRESTOR should be individualized according to goal of therapy and response. The usual recommended starting dose of CRESTOR is 10 mg once daily. However, initiation of therapy with 5 mg once daily should be considered for patients requiring less aggressive LDL-C reductions, who have predisposing factors for myopathy, and as noted below for special populations such as patients taking cyclosporine, Asian patients, and patients with severe renal insufficiency (see CLINICAL PHARMACOLOGY, Race, and Renal Insufficiency, and Drug Interactions. For patients with marked hypercholesterolemia (LDL-C > 190 mg/dL) and aggressive lipid targets, a 20-mg starting dose may be considered. After initiation and/or upon titration of CRESTOR, lipid levels should be analyzed within 2 to 4 weeks and dosage adjusted accordingly. **The 40-mg dose of CRESTOR is reserved only for those patients who have not achieved their LDL-C goal utilizing the 20 mg dose of CRESTOR once daily (see WARNINGS, Myopathy/Rhabdomyolysis).** When initiating statin therapy or switching from another statin therapy, the appropriate CRESTOR starting dose should first be utilized, and only then titrated according to the patient's individualized goal of therapy. **Homozygous Familial Hypercholesterolemia** The recommended starting dose of CRESTOR is 20 mg once daily in patients with homozygous FH. The maximum recommended daily dose is 40 mg. CRESTOR should be used in these patients as an adjunct to other lipid-lowering treatments (e.g., LDL apheresis) or if such treatments are unavailable. Response to therapy should be estimated from pre-apheresis LDL-C levels. **Dosage in Asian Patients** Initiation of CRESTOR therapy with 5 mg once daily should be considered for Asian patients. The potential for increased systemic exposures relative to Caucasians is relevant when considering escalation of dose in cases where hypercholesterolemia is not adequately controlled at doses of 5, 10, or 20 mg once daily. (See WARNINGS, Myopathy/Rhabdomyolysis, CLINICAL PHARMACOLOGY, Special Populations, Race, and PRECAUTIONS, General). **Dosage in Patients Taking Cyclosporine** In patients taking cyclosporine, therapy should be limited to CRESTOR 5 mg once daily (see WARNINGS, Myopathy/Rhabdomyolysis, and PRECAUTIONS, Drug Interactions). **Concomitant Lipid-Lowering Therapy** The effect of CRESTOR on LDL-C and total-C may be enhanced when used in combination with a bile acid binding resin. If CRESTOR is used in combination with gemfibrozil, the dose of CRESTOR should be limited to 10 mg once daily (see WARNINGS, Myopathy/Rhabdomyolysis, and PRECAUTIONS, Drug Interactions). **Dosage in Patients With Renal Insufficiency** No modification of dosage is necessary for patients with mild to moderate renal insufficiency. For patients with severe renal impairment ($CL_{cr} < 30 \text{ mL/min/1.73 m}^2$) not on hemodialysis, dosing of CRESTOR should be started at 5 mg once daily and not to exceed 10 mg once daily (see PRECAUTIONS, General, and CLINICAL PHARMACOLOGY, Special Populations, Renal Insufficiency).

NOTE: This summary provides important information about CRESTOR. For more information, please ask your doctor or health care professional about the full Prescribing Information and discuss it with them.

Rx only

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Manufactured for: AstraZeneca Pharmaceuticals LP

Wilmington, DE 19850

By: IPR Pharmaceuticals, Inc.

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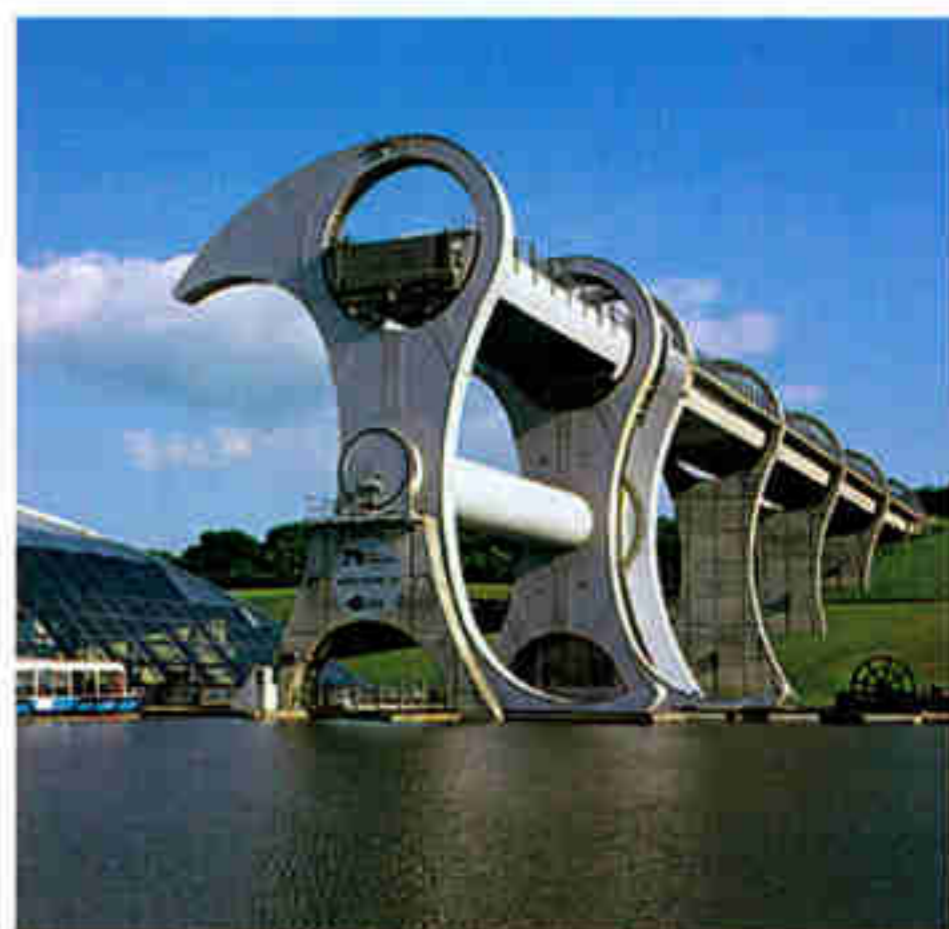
In the early 1800s, the heyday of commercial canal traffic in Scotland, a series of 11 locks connecting two canals did the lifting and lowering on what was a daylong leg of the journey between Edinburgh and Glasgow. Today a seven-minute swing of the Falkirk Wheel transfers as many as eight vessels up and down the 115-foot drop that separates the canals.

For loading, the wheel stands in the upright position (right top). Boats coming from the east along the Union Canal glide into an aqueduct that leads them to a water-filled gondola at the top of the wheel. Vessels from the Forth & Clyde Canal do the same at the bottom. Once the boats pull into the gondolas, the gates

shut, trapping the water and the floating boats. Turning with smooth precision, the wheel begins to rotate (middle), moving the upper boats down and the lower boats up (bottom).

Inaugurated in 2002, the wheel is a vital element in the rebirth of Britain's canals. The Falkirk locks were dismantled in 1933 after long-distance hauling shifted to rails and highways, and the canals were closed completely in 1965. But with the growing popularity of recreational boating, about 160 million dollars have been spent to restore the canals and link them again. Private vessels now take their turns at Falkirk alongside tour boats that carry more than 150,000 passengers a year.

—A. R. Williams



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(watching it fill up during the holidays: priceless)

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CULTURE

Christmas Past

Does a winter gathering full of excessive eating and drinking sound familiar? It's actually how ancient Romans honored their god Saturn—and it's one of the roots of modern Christmas celebrations.

As the holiday evolved, it was still too rowdy for some. In colonial Massachusetts, December 25 was just another day. It had to be: Puritans associated Christmas celebrations with pagan rituals and imposed a fine on revelers.

It wasn't until the 1800s that many Yuletide customs Americans know today became common. European immigrants to the United States brought with them traditions of Christmas trees and St. Nicholas. That fourth-century holy man was popularized in 1809 by writer Washington Irving in *A History of New York*. A jolly image was reinforced by Clement Moore's 1822 poem about the night before Christmas.

In the 20th century, Christmas customs went global. Though less than one percent of its population is Christian, Japan has embraced all the trappings of Christmas. And Santa has ridden the coattails of consumerism into Russia, where a folk figure named Grandfather Frost has traditionally reigned during the holidays. Today Russians keep Grandfather Frost in their hearts, and Santa in their stores.

—Whitney Dangerfield



BETTMANN/CORBIS

1863 Thomas Nast in *Harper's Weekly* begins to shape Santa's modern look (art above from 1881).



© PARAMOUNT PICTURES

1941 The song "White Christmas" debuts. The best-selling Christmas tune ever, it inspired the 1954 movie (above).



YOSHIKAZU TSUNO, AFP/GETTY IMAGES



SCALA/ART RESOURCE, NY

354 A Roman almanac lists December 25 as Christ's birthday. Centuries pass before the date is widely recognized.

1848 Queen Victoria's Windsor Castle Christmas tree (below) sets a trend for holiday greenery.



BETTMANN/CORBIS

1870 Christmas becomes a federal holiday in the United States.

1931 Rockefeller Center's tree distracts from its construction debris; a New York tradition is born (below).



STAN HONDA, AFP/GETTY IMAGES

1989 Berlin Wall falls. The ban on observing Christmas is later lifted in former communist countries.

2003 Christmas traditions have spread to Japan, where a robot leads carols (left) at a holiday concert.

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GAUTAM SINGH, AP/WIDE WORLD PHOTOS; REUTERS/CORBIS (BELOW)

INDIA

Life After Veerappan's Death

Forest thrives since the killing of India's legendary bandit

He started poaching elephants for ivory in the 1960s. Then over the years bandit Koose Veerappan (below) expanded both his activities and territory, spreading crime and terror over 3,800 square miles of forest in the southern Indian states of Tamil Nadu, Karnataka, and Kerala.

Veerappan's smuggling operation felled tens of thousands of endangered sandalwood trees—valued for their fragrance and for decorative carving. He and his gang profited from ransoms paid for high-profile kidnappings, including that of an Indian movie star in 2000. They also murdered with impunity.

Constant mobility and jungle



survival skills helped Veerappan elude police for decades. Wanted posters (above) were of little help to the law; villagers feared reprisals. Many of them lost jobs when officials closed area granite quarries to stem the owners' extortion payments to the bandit.

In October 2004 the police finally killed Veerappan, age 52, in an ambush. Officials worried that his death might create opportunities for other big-time poachers, but so far they have stayed away. Some 200 new officers, former members of a special anti-Veerappan force, now patrol his old territory. Though the population of sandalwood trees had been decimated, few have been cut recently. Even the region's revered hanuman langurs—monkeys Veerappan slaughtered because he believed drinking their blood added to his strength—are now thriving. Some of the quarries will soon reopen too. Tamil Nadu's conservator of forests, A. S. Jafry, says he couldn't risk patrols while Veerappan was alive. "Now we're in control of the whole forest again."

—Sam Jaffe

PLANT EVOLUTION

Turning a New Leaf

Scientists may have solved an evolutionary puzzle: Why did plants take so long—roughly 50 million years—to develop large leaves?

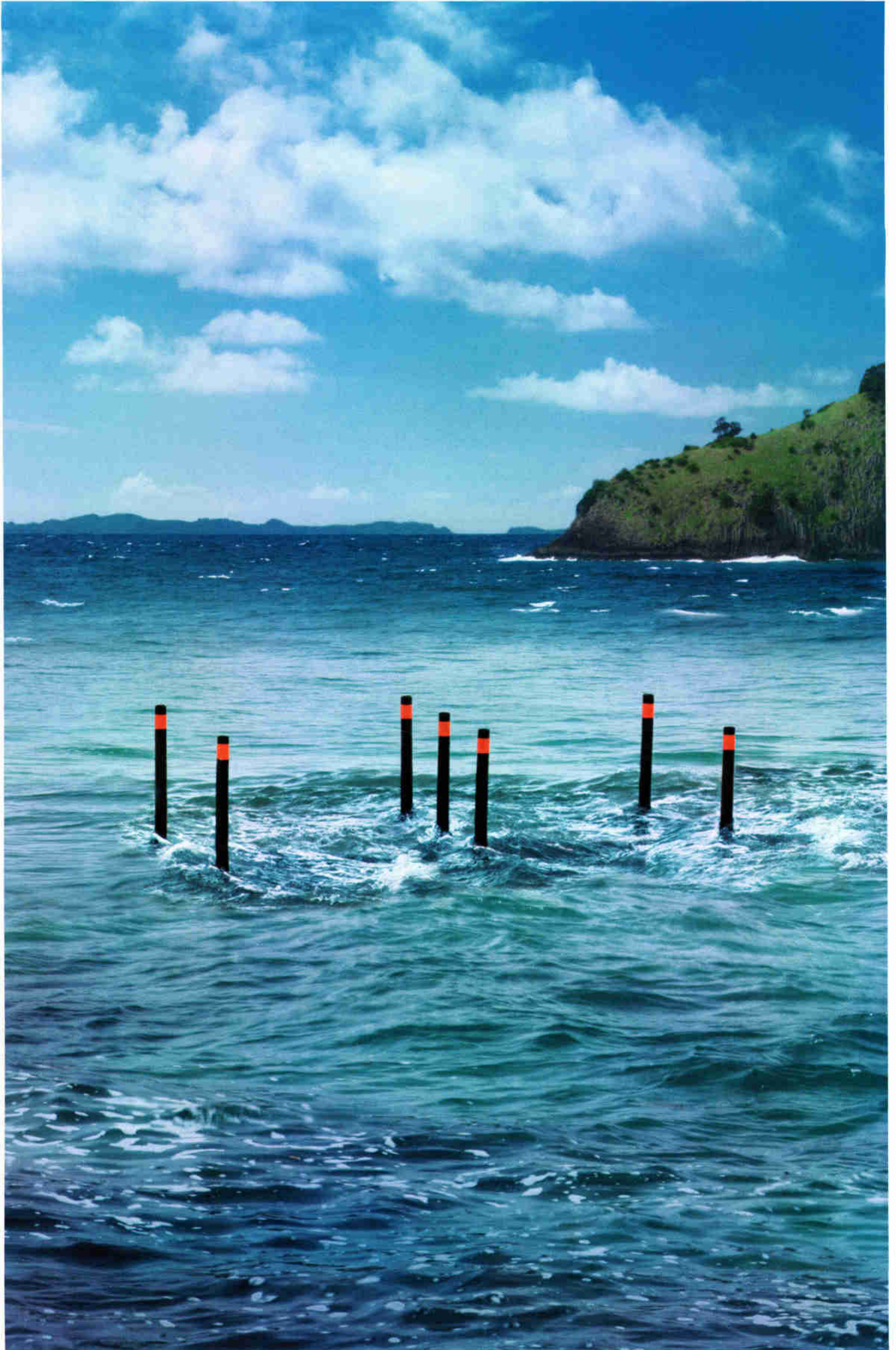
About 380 million years ago, levels of atmospheric carbon dioxide (CO₂), a greenhouse gas, were high, as was the temperature, giving plants with twig-like leaves—like *Calamophyton primaevum* (fossil, below)—an advantage: Small leaves can take the heat. But in the late Devonian period, CO₂ levels and temperatures gradually dropped. To survive, plants developed larger leaves—like *Archaeopteris hibernica* (fossil, bottom)—according to a study led by British botanist Colin Osborne. Bigger leaves have more stomata, or pores, which allow plants to absorb more CO₂. "The evolutionary brakes were finally off," says Osborne. —Angela Botzler



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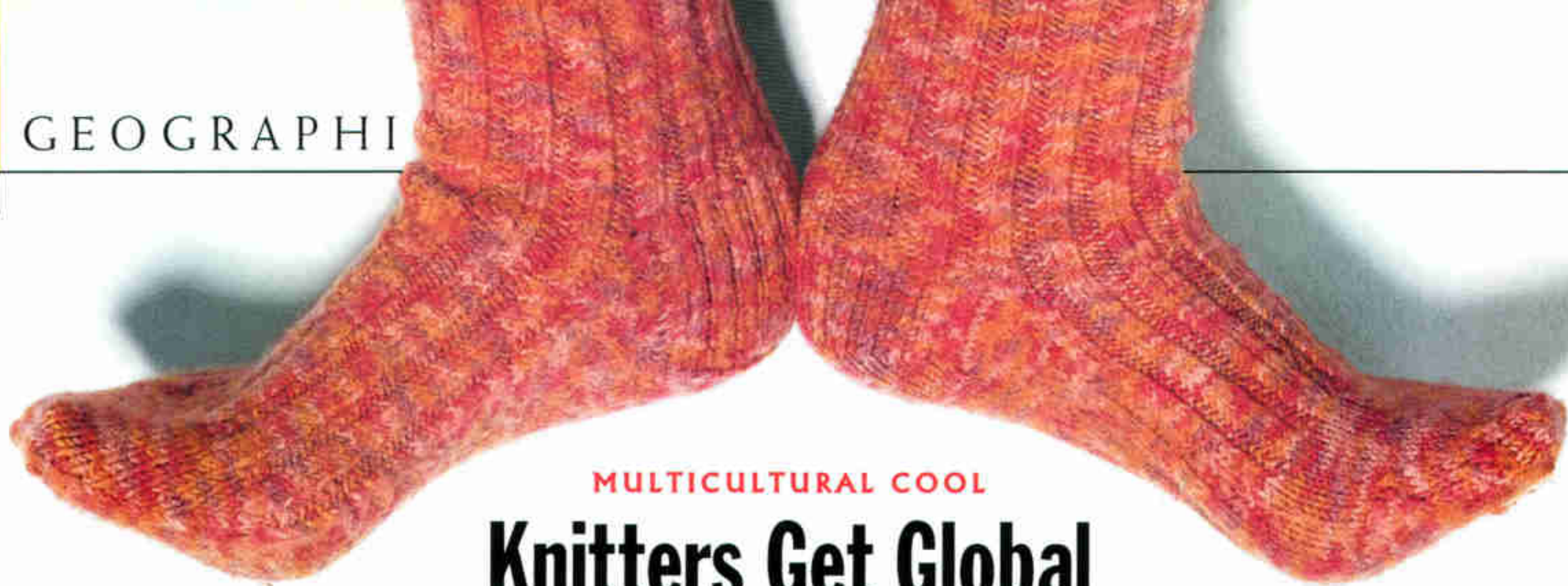


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MULTICULTURAL COOL

Knitters Get Global

Handmade socks are the height of hip

Germany Computer-controlled color sequences applied to sock yarns automatically work up into stripes and other designs.

U.S. Fiber artist Deborah Daniels hand-dyes yarns spun from a blend of Chinese hemp and American wool in her Ohio studio.

Japan Yarn from here and Ireland makes up this tote designed by a Chinese-American Londoner who was inspired by French market bags.

Italy Companies across Europe depend on Italian mills to spin novelty yarns—all fluff, ribbons, and glitter.

Nepal Working from their homes, women in the Himalaya hand-spin silk fibers recycled from sari fabric manufacture.

Peru Organically grown cotton is selectively bred for color—green, brown, even mauve—to produce colored yarns without dye.

U.K. Goats raised in South Africa and Texas grow mohair spun into yarn in England and hand-dyed in Wales.

M eet Lew Rose: He's a six-foot-four Washington, D.C., lawyer with an after-hours fondness for mosh pits—and knitting. He's working with Mongolian cashmere on German needles to make a sweater patterned with Irish cables. Lew got stunned looks when he first brought his hand-knit gifts to work. "But now people come up and ask what I'm going to make for them," he says.

The Craft Yarn Council reports that Americans spent more than half a billion dollars on knitting and crocheting supplies last year. New yarn stores pop up like coffee shops, and Hollywood stars take their stitching to the set. Why is this once homey craft so hot? The theories range from post-September 11 cocooning to a neo-feminist embrace of traditional skills. But the explosion of new yarns from all over

the world—captivating colors, wild textures, lush fibers—also lures new knitters. Australians line up to buy sweater kits from Denmark; Canadians knit ski caps out of wool from Uruguay. At an Atlantic City, New Jersey, knitters' convention, Californian Lori Genzer stroked a plush hank of alpaca. "This is from Peru," she said. "I've never been to Peru, but this yarn's coming home with me." —Lynne Warren

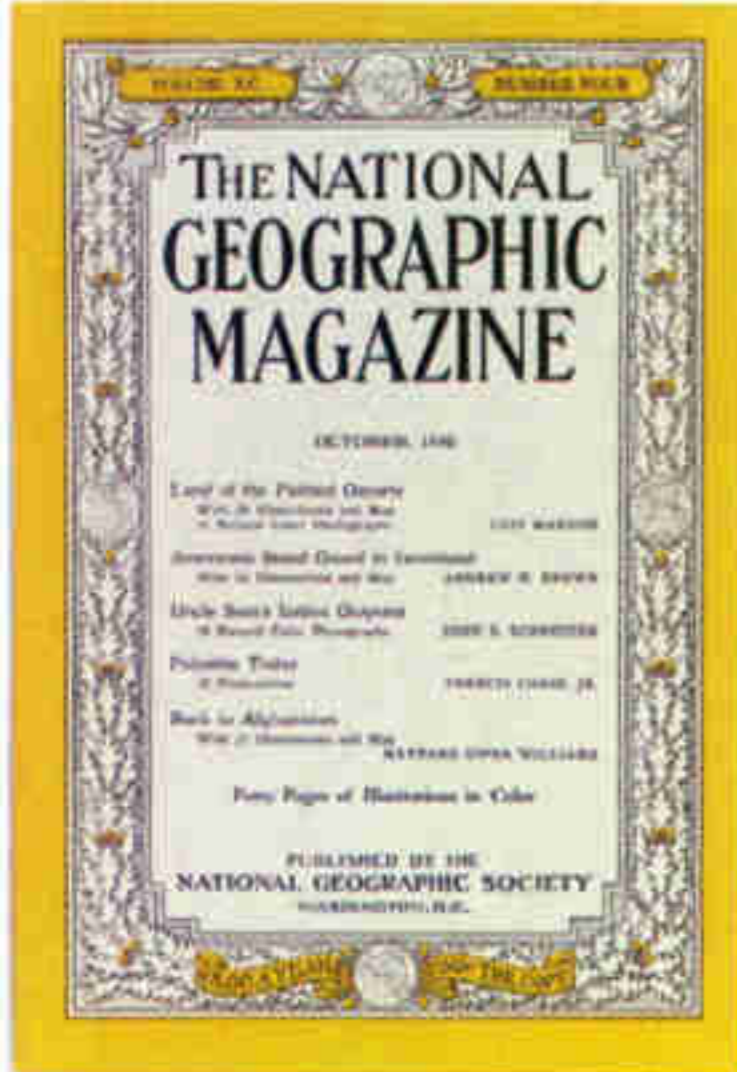
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MIDDLE EAST

Palestine 1946

World War II has recently ended, and the horrors of the Holocaust have been revealed. The creation of the state of Israel is almost two years away, but the notion of a Jewish homeland is the topic of much debate and the source of occasional violence. In this uncertain moment NATIONAL GEOGRAPHIC publishes “Palestine Today,” by Francis Chase, Jr., adapted in these pages. Except for a few references—a mention of Jewish militants blowing up a Tel Aviv hotel, an aerial photograph of that city whose caption notes that a siege of the “all-Jewish city” turned up

“ammunition caches and suspected terrorists”—it offers few hints of the decades of conflict ahead. Instead, it describes a 17-year-old survivor of the Buchenwald concentration camp tilling “the land of her dreams,” and a scene along the Sea of Galilee in which “an Arab village and a Jewish collective farm exist side by side.” “The black goat-hair tents and mud huts were giving way to houses . . . as the land became more solidly settled,” Chase wrote. “There was a difference in time, in methods, and in equipment, but . . . a visit to Palestine today is much like a visit to America of yesterday.”

—Boris Weintraub

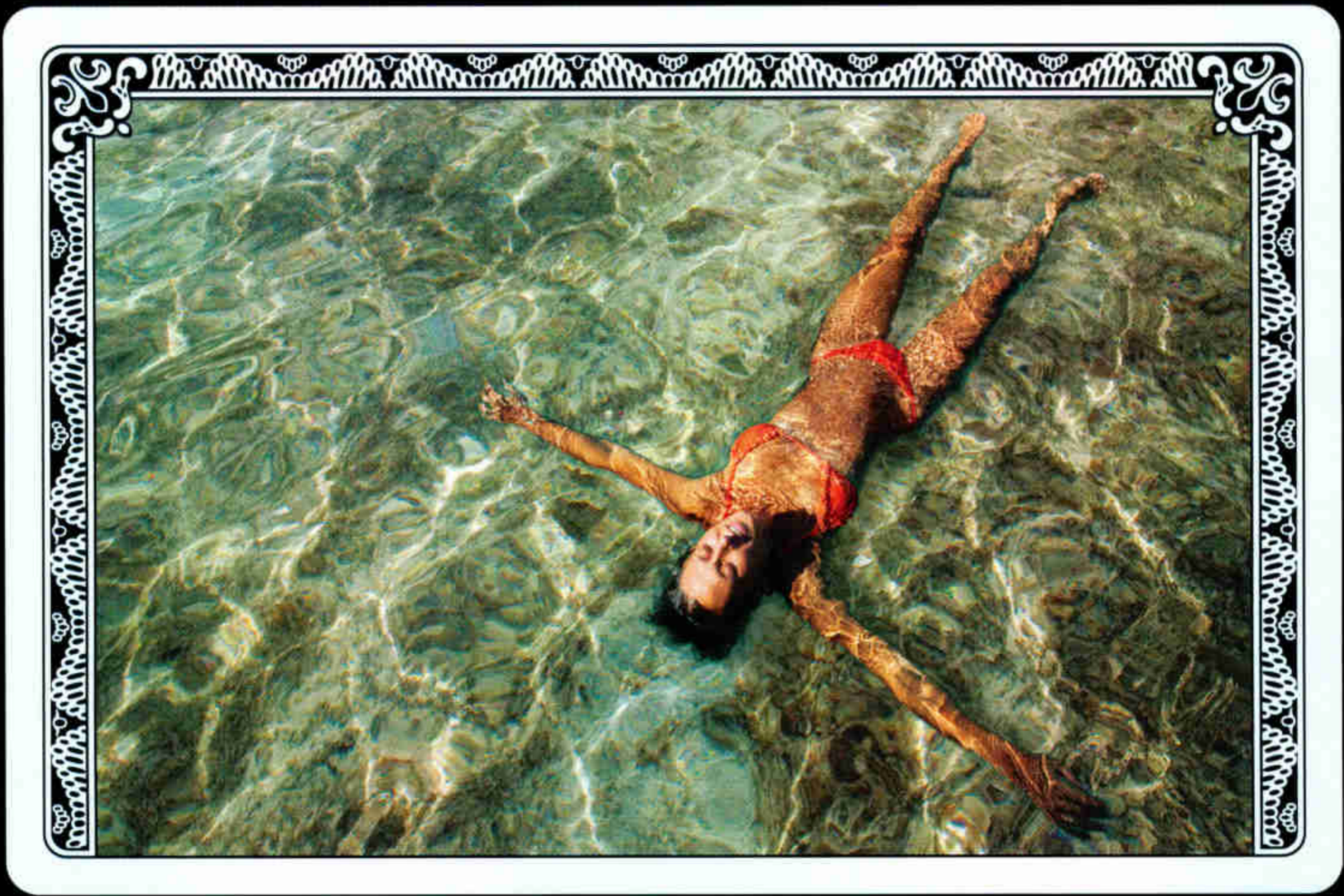
► Read more about the West Bank and Gaza at ngm.com/0210/feature5.



AP/WIDE WORLD PHOTOS

Singing, shouting survivors of concentration camps march through barbed wire and into the hands of Palestinian authorities. They remained at Atlit camp, near Haifa, until the quota system—1,500 immigrants a month—certified them.

All captions adapted from the original October 1946 article in NATIONAL GEOGRAPHIC.



HOW TO RECHARGE

a

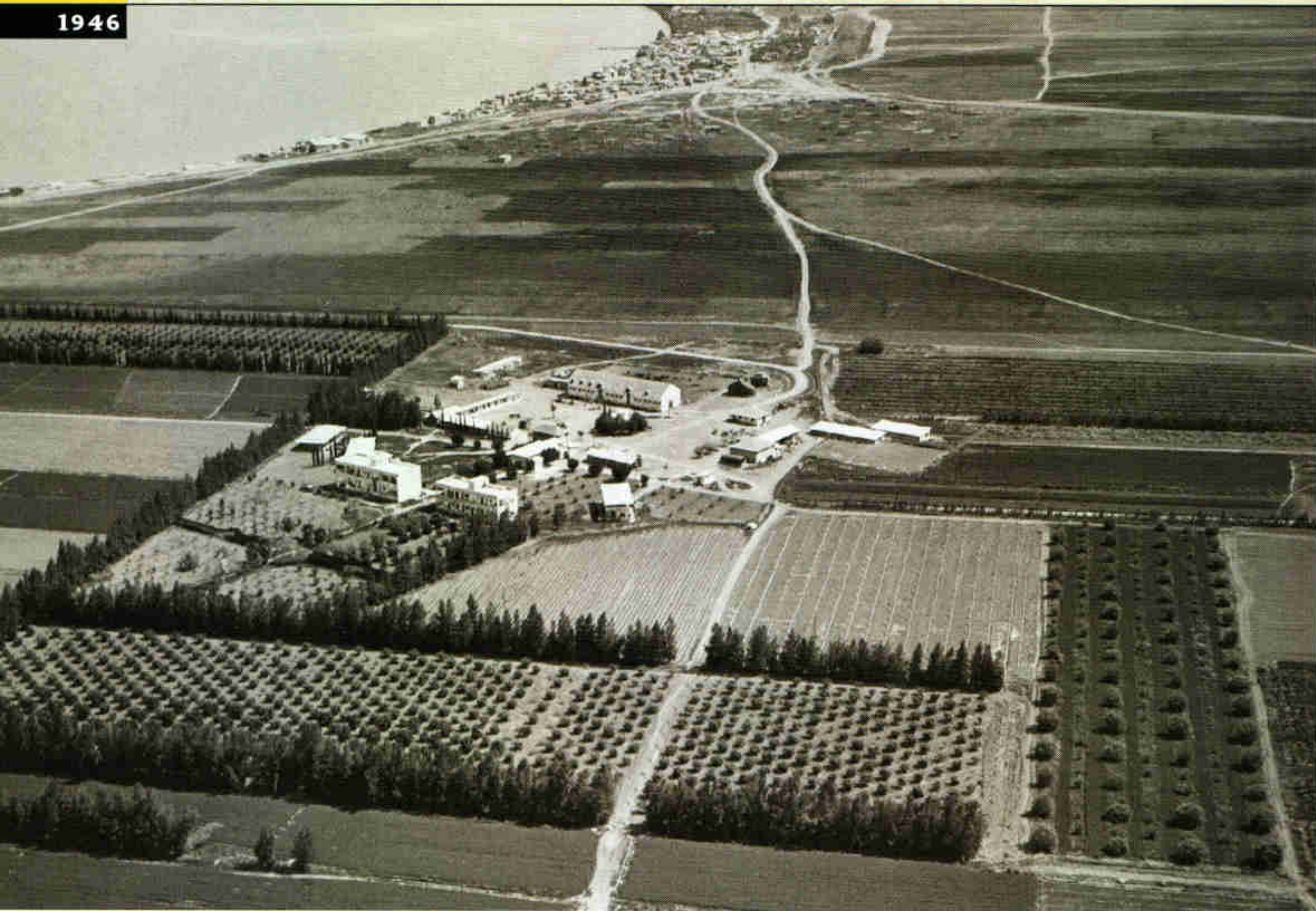
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1946



Along the Sea of Galilee an Arab village and a Jewish collective farm (above, at center) exist side by side. Fertile fields, irrigated with water from the River Jordan, produce eight clover crops a year; young orchards are protected by windbreaks of cypress. Below, carnallite, a source of potassium, comes out of brine from the Dead Sea. Here, at 1,365 feet below sea level, men from Europe had a serious problem acclimatizing, and malaria initially incapacitated half the pioneers. It has been conquered, and now a thousand Jews work beside a thousand Arabs.



G. ERIC MATSON (TOP); AP/WIDE WORLD PHOTOS

**At 6'4", 220 pounds,
Bob is a formidable man.
But he's no match for something
one millionth his size.**

A CLOT.

Clots are the number one cause of heart attack and stroke, but you can help reduce your risk.

This is important information if you've been hospitalized with heart-related chest pain or a certain type of heart attack.

That's because these conditions, known as Acute Coronary Syndrome – or ACS – are usually caused when blood platelets stick together and form clots that block blood flow to your heart. And if you've already had a clot, you're at an increased risk for a future heart attack or stroke.



PLAVIX, in combination with aspirin, helps provide greater protection against a future heart attack or stroke than aspirin alone.

PLAVIX, taken with aspirin, plays its own role in helping reduce your risk of heart attack and stroke. That's because, unlike your cholesterol and blood pressure medications, prescription PLAVIX works directly to help keep blood platelets from sticking together and forming clots.



IMPORTANT INFORMATION: If you have a stomach ulcer or other condition that causes bleeding, you shouldn't use PLAVIX. When taking PLAVIX alone or with some medicines including aspirin, the risk of bleeding may increase. To minimize this risk, talk to your doctor before taking aspirin or other medicines with PLAVIX. Additional rare but serious side effects could occur.

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Brief Summary of Prescribing Information Rev. May 2005

INDICATIONS AND USAGE

PLAVIX (clopidogrel bisulfate) is indicated for the reduction of atherothrombotic events as follows:

• Recent MI, Recent Stroke or Established Peripheral Arterial Disease

For patients with a history of recent myocardial infarction (MI), recent stroke, or established peripheral arterial disease, PLAVIX has been shown to reduce the rate of a combined endpoint of new ischemic stroke (fatal or not), new MI (fatal or not), and other vascular death.

• Acute Coronary Syndrome

For patients with acute coronary syndrome (unstable angina/non-Q-wave MI) including patients who are to be managed medically and those who are to be managed with percutaneous coronary intervention (with or without stent) or CABG, PLAVIX has been shown to decrease the rate of a combined endpoint of cardiovascular death, MI, or stroke as well as the rate of a combined endpoint of cardiovascular death, MI, stroke, or refractory ischemia.

CONTRAINDICATIONS

The use of PLAVIX is contraindicated in the following conditions:

- Hypersensitivity to the drug substance or any component of the product.
- Active pathological bleeding such as peptic ulcer or intracranial hemorrhage.

WARNINGS

Thrombotic thrombocytopenic purpura (TTP): TTP has been reported rarely following use of PLAVIX, sometimes after a short exposure (<2 weeks). TTP is a serious condition and requires urgent referral to a hematologist for prompt treatment. It is characterized by thrombocytopenia, microangiopathic hemolytic anemia (schistocytes [fragmented RBCs] seen on peripheral smear), neurological findings, renal dysfunction, and fever. TTP was not seen during clopidogrel's clinical trials, which included over 17,500 clopidogrel-treated patients. In world-wide postmarketing experience, however, TTP has been reported at a rate of about four cases per million patients exposed, or about 11 cases per million patient-years. The background rate is thought to be about four cases per million person-years. (See **ADVERSE REACTIONS**.)

PRECAUTIONS

General

PLAVIX prolongs the bleeding time and therefore should be used with caution in patients who may be at risk of increased bleeding from trauma, surgery, or other pathological conditions (particularly gastrointestinal and intraocular). If a patient is to undergo elective surgery and an antiplatelet effect is not desired, PLAVIX should be discontinued 5 days prior to surgery.

Due to the risk of bleeding and undesirable hematological effects, blood cell count determination and/or other appropriate testing should be promptly considered, whenever such suspected clinical symptoms arise during the course of treatment (see **ADVERSE REACTIONS**).

In patients with recent TIA or stroke who are at high risk for recurrent ischemic events, the combination of aspirin and PLAVIX has not been shown to be more effective than PLAVIX alone, but the combination has been shown to increase major bleeding.

GI Bleeding: In CAPRIE, PLAVIX was associated with a rate of gastrointestinal bleeding of 2.0%, vs. 2.7% on aspirin. In CURE, the incidence of major gastrointestinal bleeding was 1.3% vs 0.7% (PLAVIX + aspirin vs. placebo + aspirin, respectively). PLAVIX should be used with caution in patients who have lesions with a propensity to bleed (such as ulcers). Drugs that might induce such lesions should be used with caution in patients taking PLAVIX.

Use in Hepatically Impaired Patients: Experience is limited in patients with severe hepatic disease, who may have bleeding diatheses. PLAVIX should be used with caution in this population.

Use in Renally-impaired Patients: Experience is limited in patients with severe renal impairment. PLAVIX should be used with caution in this population.

Information for Patients

Patients should be told that they may bleed more easily and it may take them longer than usual to stop bleeding when they take PLAVIX or PLAVIX combined with aspirin; and that they should report any unusual bleeding to their physician. Patients should inform physicians and dentists that they are taking PLAVIX and/or any other product known to affect bleeding before any surgery is scheduled and before any new drug is taken.

Drug Interactions

Study of specific drug interactions yielded the following results:

Aspirin: Aspirin did not modify the clopidogrel-mediated inhibition of ADP-induced platelet aggregation. Concomitant administration of 500 mg of aspirin twice a day for 1 day did not significantly increase the prolongation of bleeding time induced by PLAVIX. PLAVIX potentiated the effect of aspirin on collagen-induced platelet aggregation. PLAVIX and aspirin have been administered together for up to one year.

Heparin: In a study in healthy volunteers, PLAVIX did not necessitate modification of the heparin dose or alter the effect of heparin on coagulation. Coadministration of heparin had no effect on inhibition of platelet aggregation induced by PLAVIX.

Nonsteroidal Anti-Inflammatory Drugs (NSAIDs): In healthy volunteers receiving naproxen, concomitant administration of PLAVIX was associated with increased occult gastrointestinal blood loss. NSAIDs and PLAVIX should be coadministered with caution.

Warfarin: Because of the increased risk of bleeding, the concomitant administration of warfarin with PLAVIX should be undertaken with caution. (See **PRECAUTIONS—General**.)

Other Concomitant Therapy: No clinically significant pharmacodynamic interactions were observed when PLAVIX was coadministered with atenolol, nifedipine, or both atenolol and nifedipine. The pharmacodynamic activity of PLAVIX was also not significantly influenced by the coadministration of phenobarbital, cimetidine or estrogen.

The pharmacokinetics of digoxin or theophylline were not modified by the coadministration of PLAVIX (clopidogrel bisulfate).

At high concentrations *in vitro*, clopidogrel inhibits P₄₅₀ (2C9). Accordingly, PLAVIX may interfere with the metabolism of phenytoin, tamoxifen, tolbutamide, warfarin, torsemide, fluvastatin, and many non-steroidal anti-inflammatory agents, but there are no data with which to predict the magnitude of these interactions. Caution should be used when any of these drugs is coadministered with PLAVIX.

In addition to the above specific interaction studies, patients entered into clinical trials with PLAVIX received a variety of concomitant medications including diuretics, beta-blocking agents, angiotensin converting enzyme inhibitors, calcium antagonists, cholesterol lowering agents, coronary vasodilators, antidiabetic agents (including insulin), antiepileptic agents, hormone replacement therapy, heparins (unfractionated and LMWH) and GPIIb/IIIa antagonists without evidence of clinically significant adverse interactions. The use of oral anticoagulants, non-study antiplatelet drug and chronic NSAIDs was not allowed in CURE and there are no data on their concomitant use with clopidogrel.

Drug/Laboratory Test Interactions

None known.

Carcinogenesis, Mutagenesis, Impairment of Fertility

There was no evidence of tumorigenicity when clopidogrel was administered for 78 weeks to mice and 104 weeks to rats at dosages up to 77 mg/kg per day, which afforded plasma exposures >25 times that in humans at the recommended daily dose of 75 mg.

Clopidogrel was not genotoxic in four *in vitro* tests (Ames test, DNA-repair test in rat hepatocytes, gene mutation assay in Chinese hamster fibroblasts, and metaphase chromosome analysis of human lymphocytes) and in one *in vivo* test (micronucleus test by oral route in mice).

Clopidogrel was found to have no effect on fertility of male and female rats at oral doses up to 400 mg/kg per day (52 times the recommended human dose on a mg/m² basis).

Pregnancy

Pregnancy Category B. Reproduction studies performed in rats and rabbits at doses up to 500 and 300 mg/kg/day (respectively, 65 and 78 times the recommended daily human dose on a mg/m² basis), revealed no evidence of impaired fertility or fetotoxicity due to clopidogrel. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of a human response, PLAVIX should be used during pregnancy only if clearly needed.

Nursing Mothers

Studies in rats have shown that clopidogrel and/or its metabolites are excreted in the milk. It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the nursing woman.

Pediatric Use

Safety and effectiveness in the pediatric population have not been established.

Geriatric Use

Of the total number of subjects in controlled clinical studies, approximately 50% of patients treated with PLAVIX were 65 years of age and over. Approximately 16% of patients treated with PLAVIX were 75 years of age and over.

The observed difference in risk of thrombotic events with clopidogrel plus aspirin versus placebo plus aspirin by age category is provided in Figure 3 (see **CLINICAL STUDIES**). The observed difference in risk of bleeding events with clopidogrel plus aspirin versus placebo plus aspirin by age category is provided in Table 3 (see **ADVERSE REACTIONS**).

ADVERSE REACTIONS

PLAVIX has been evaluated for safety in more than 17,500 patients, including over 9,000 patients treated for 1 year or more. The overall tolerability of PLAVIX in CAPRIE was similar to that of aspirin regardless of age, gender and race, with an approximately equal incidence (13%) of patients withdrawing from treatment because of adverse reactions. The clinically important adverse events observed in CAPRIE and CURE are discussed below.

Hemorrhagic: In CAPRIE patients receiving PLAVIX, gastrointestinal hemorrhage occurred at a rate of 2.0%, and required hospitalization in 0.7%. In patients receiving aspirin, the corresponding rates were 2.7% and 1.1%, respectively. The incidence of intracranial hemorrhage was 0.4% for PLAVIX compared to 0.5% for aspirin.

In CURE, PLAVIX use with aspirin was associated with an increase in bleeding compared to placebo with aspirin (see Table 3). There was an excess in major bleeding in patients receiving PLAVIX plus aspirin compared with placebo plus aspirin, primarily gastrointestinal and at puncture sites. The incidence of intracranial hemorrhage (0.1%), and fatal bleeding (0.2%), were the same in both groups.

The overall incidence of bleeding is described in Table 3 for patients receiving both PLAVIX and aspirin in CURE.

Table 3: CURE Incidence of bleeding complications (% patients)

Event	PLAVIX (+ aspirin)* (n=6259)	Placebo (+ aspirin)* (n=6303)	P-value
Major bleeding †	3.7 ‡	2.7 §	0.001
Life-threatening bleeding	2.2	1.8	0.13
Fatal	0.2	0.2	
5 g/dL hemoglobin drop	0.9	0.9	
Requiring surgical intervention	0.7	0.7	
Hemorrhagic strokes	0.1	0.1	
Requiring inotropes	0.5	0.5	
Requiring transfusion (≥4 units)	1.2	1.0	
Other major bleeding	1.6	1.0	0.005
Significantly disabling	0.4	0.3	
Intraocular bleeding with significant loss of vision	0.05	0.03	
Requiring 2-3 units of blood	1.3	0.9	
Minor bleeding ¶	5.1	2.4	<0.001

* Other standard therapies were used as appropriate.

† Life threatening and other major bleeding.

‡ Major bleeding event rate for PLAVIX + aspirin was dose-dependent on aspirin: <100 mg=2.6%;

100-200 mg= 3.5%; >200 mg=4.9%

§ Major bleeding event rates for placebo + aspirin by age were: <65 years = 2.5%, ≥65 to <75 years = 4.1%, ≥75 years 5.9%

¶ Major bleeding event rate for placebo + aspirin was dose-dependent on aspirin: <100 mg=2.0%; 100-200 mg= 2.3%; >200 mg=4.0%

Major bleeding event rates for placebo + aspirin by age were: <65 years = 2.1%, ≥65 to <75 years = 3.1%, ≥75 years 3.6%

¶¶ Led to interruption of study medication.

Ninety-two percent (92%) of the patients in the CURE study received heparin/LMWH, and the rate of bleeding in these patients was similar to the overall results.

There was no excess in major bleeds within seven days after coronary bypass graft surgery in patients who stopped therapy more than five days prior to surgery (event rate 4.4% PLAVIX + aspirin; 5.3% placebo + aspirin). In patients who remained on therapy within five days of bypass graft surgery, the event rate was 9.6% for PLAVIX + aspirin, and 6.3% for placebo + aspirin.

Neutropenia/agranulocytosis: Ticlopidine, a drug chemically similar to PLAVIX, is associated with a 0.8% rate of severe neutropenia (less than 450 neutrophils/ μ L). In CAPRIE severe neutropenia was observed in six patients, four on PLAVIX and two on aspirin. Two of the 9599 patients who received PLAVIX and none of the 9586 patients who received aspirin had neutrophil counts of zero. One of the four PLAVIX patients in CAPRIE was receiving cytotoxic chemotherapy, and another recovered and returned to the trial after only temporarily interrupting treatment with PLAVIX (clopidogrel bisulfate). In CURE, the numbers of patients with thrombocytopenia (19 PLAVIX + aspirin vs. 24 placebo + aspirin) or neutropenia (3 vs. 3) were similar.

Although the risk of myelotoxicity with PLAVIX (clopidogrel bisulfate) thus appears to be quite low, this possibility should be considered when a patient receiving PLAVIX demonstrates fever or other sign of infection.

Gastrointestinal: Overall, the incidence of gastrointestinal events (e.g. abdominal pain, dyspepsia, gastritis and constipation) in patients receiving PLAVIX (clopidogrel bisulfate) was 27.1%, compared to 29.8% in those receiving aspirin in the CAPRIE trial. In the CURE trial the incidence of these gastrointestinal events for patients receiving PLAVIX + aspirin was 11.7% compared to 12.5% for those receiving placebo + aspirin.

In the CAPRIE trial, the incidence of peptic, gastric or duodenal ulcers was 0.7% for PLAVIX (clopidogrel bisulfate) and 1.2% for aspirin. In the CURE trial the incidence of peptic, gastric or duodenal ulcers was 0.4% for PLAVIX + aspirin and 0.3% for placebo + aspirin.

Cases of diarrhea were reported in the CAPRIE trial in 4.5% of patients in the PLAVIX group compared to 3.4% in the aspirin group. However, these were rarely severe (PLAVIX=0.2% and aspirin=0.1%). In the CURE trial, the incidence of diarrhea for patients receiving PLAVIX + aspirin was 2.1% compared to 2.2% for those receiving placebo + aspirin.

In the CAPRIE trial, the incidence of patients withdrawing from treatment because of gastrointestinal adverse reactions was 3.2% for PLAVIX and 4.0% for aspirin. In the CURE trial, the incidence of patients withdrawing from treatment because of gastrointestinal adverse reactions was 0.9% for PLAVIX + aspirin compared with 0.8% for placebo + aspirin.

Rash and Other Skin Disorders: In the CAPRIE trial, the incidence of skin and appendage disorders in patients receiving PLAVIX was 15.8% (0.7% serious); the corresponding rate in aspirin patients was 13.1% (0.5% serious). In the CURE trial the incidence of rash or other skin disorders in patients receiving PLAVIX + aspirin was 4.0% compared to 3.5% for those receiving placebo + aspirin.

In the CAPRIE trial, the overall incidence of patients withdrawing from treatment because of skin and appendage disorders adverse reactions was 1.5% for PLAVIX and 0.8% for aspirin. In the CURE trial, the incidence of patients withdrawing because of skin and appendage disorders adverse reactions was 0.7% for PLAVIX + aspirin compared with 0.3% for placebo + aspirin.

Adverse events occurring in ≥2.5% of patients on PLAVIX in the CAPRIE controlled clinical trial are shown below regardless of relationship to PLAVIX. The median duration of therapy was 20 months, with a maximum of 3 years.

Table 4: Adverse Events Occurring in ≥ 2.5% of PLAVIX Patients in CAPRIE

Body System Event	% Incidence (% Discontinuation)	
	PLAVIX [n=9599]	Aspirin [n=9586]
<i>Body as a Whole – general disorders</i>		
Chest Pain	8.3 (0.2)	8.3 (0.3)
Accidental/Inflicted Injury	7.9 (0.1)	7.3 (0.1)
Influenza-like symptoms	7.5 (<0.1)	7.0 (<0.1)
Pain	6.4 (0.1)	6.3 (0.1)
Fatigue	3.3 (0.1)	3.4 (0.1)
<i>Cardiovascular disorders, general</i>		
Edema	4.1 (<0.1)	4.5 (<0.1)
Hypertension	4.3 (<0.1)	5.1 (<0.1)
<i>Central & peripheral nervous system disorders</i>		
Headache	7.6 (0.3)	7.2 (0.2)
Dizziness	6.2 (0.2)	6.7 (0.3)
<i>Gastrointestinal system disorders</i>		
Abdominal pain	5.6 (0.7)	7.1 (1.0)
Dyspepsia	5.2 (0.6)	6.1 (0.7)
Diarrhea	4.5 (0.4)	3.4 (0.3)
Nausea	3.4 (0.5)	3.8 (0.4)
<i>Metabolic & nutritional disorders</i>		
Hypercholesterolemia	4.0 (0)	4.4 (<0.1)
<i>Musculo-skeletal system disorders</i>		
Arthralgia	6.3 (0.1)	6.2 (0.1)
Back Pain	5.8 (0.1)	5.3 (<0.1)
<i>Platelet, bleeding, & clotting disorders</i>		
Purpura/Bruise	5.3 (0.3)	3.7 (0.1)
Epistaxis	2.9 (0.2)	2.5 (0.1)
<i>Psychiatric disorders</i>		
Depression	3.6 (0.1)	3.9 (0.2)
<i>Respiratory system disorders</i>		
Upper resp tract infection	8.7 (<0.1)	8.3 (<0.1)
Dyspnea	4.5 (0.1)	4.7 (0.1)
Rhinitis	4.2 (0.1)	4.2 (<0.1)
Bronchitis	3.7 (0.1)	3.7 (0)
Coughing	3.1 (<0.1)	2.7 (<0.1)
<i>Skin & appendage disorders</i>		
Rash	4.2 (0.5)	3.5 (0.2)
Pruritus	3.3 (0.3)	1.6 (0.1)
<i>Urinary system disorders</i>		
Urinary tract infection	3.1 (0)	3.5 (0.1)

Incidence of discontinuation, regardless of relationship to therapy, is shown in parentheses.

Adverse events occurring in ≥2.0% of patients on PLAVIX in the CURE controlled clinical trial are shown below regardless of relationship to PLAVIX.

Table 5: Adverse Events Occurring in ≥ 2.0% of PLAVIX Patients in CURE

Body System Event	% Incidence (% Discontinuation)	
	PLAVIX (+ aspirin)* [n=6259]	Placebo (+ aspirin)* [n=6303]
<i>Body as a Whole – general disorders</i>		
Chest Pain	2.7 (<0.1)	2.8 (0.0)
<i>Central & peripheral nervous system disorders</i>		
Headache	3.1 (0.1)	3.2 (0.1)
Dizziness	2.4 (0.1)	2.0 (<0.1)
<i>Gastrointestinal system disorders</i>		
Abdominal pain	2.3 (0.3)	2.8 (0.3)
Dyspepsia	2.0 (0.1)	1.9 (<0.1)
Diarrhea	2.1 (0.1)	2.2 (0.1)

*Other standard therapies were used as appropriate.

Other adverse experiences of potential importance occurring in 1% to 2.5% of patients receiving PLAVIX (clopidogrel bisulfate) in the CAPRIE or CURE controlled clinical trials are listed below regardless of relationship to PLAVIX. In general, the incidence of these events was similar to that in patients receiving aspirin (in CAPRIE) or placebo + aspirin (in CURE).

Autonomic Nervous System Disorders: Syncope, Palpitation. *Body as a Whole-general disorders:* Asthenia, Fever, Hernia. *Cardiovascular disorders:* Cardiac failure. *Central and peripheral nervous system disorders:* Cramps legs, Hypoaesthesia, Neuralgia, Paraesthesia, Vertigo. *Gastrointestinal system disorders:* Constipation, Vomiting. *Heart rate and rhythm disorders:* Fibrillation atrial. *Liver and biliary system disorders:* Hepatic enzymes increased. *Metabolic and nutritional disorders:* Gout, hyperuricemia, non-protein nitrogen (NPN) increased. *Musculo-skeletal system disorders:* Arthritis, Arthrosis. *Platelet, bleeding & clotting disorders:* GI hemorrhage, hematoma, platelets decreased. *Psychiatric disorders:* Anxiety, Insomnia. *Red blood cell disorders:* Anemia. *Respiratory system disorders:* Pneumonia, Sinusitis. *Skin and appendage disorders:* Eczema, Skin ulceration. *Urinary system disorders:* Cystitis. *Vision disorders:* Cataract, Conjunctivitis.

Other potentially serious adverse events which may be of clinical interest but were rarely reported (<1%) in patients who received PLAVIX in the CAPRIE or CURE controlled clinical trials are listed below regardless of relationship to PLAVIX. In general, the incidence of these events was similar to that in patients receiving aspirin (in CAPRIE) or placebo + aspirin (in CURE).

Body as a whole: Allergic reaction, necrosis ischemic. *Cardiovascular disorders:* Edema generalized. *Gastrointestinal system disorders:* Gastric ulcer perforated, gastritis hemorrhagic, upper GI ulcer hemorrhagic. *Liver and Biliary system disorders:* Bilirubinemia, hepatitis infectious, liver fatty. *Platelet, bleeding and clotting disorders:* hemarthrosis, hematuria, hemoptysis, hemorrhage intracranial, hemorrhage retroperitoneal, hemorrhage of operative wound, ocular hemorrhage, pulmonary hemorrhage, purpura allergic, thrombocytopenia. *Red blood cell disorders:* Anemia aplastic, anemia hypochromic. *Reproductive disorders, female:* Menorrhagia. *Respiratory system disorders:* Hemothorax. *Skin and appendage disorders:* Bullous eruption, rash erythematous, rash maculopapular, urticaria. *Urinary system disorders:* Abnormal renal function, acute renal failure. *White cell and reticuloendothelial system disorders:* Agranulocytosis, granulocytopenia, leukemia, leukopenia, neutrophils decreased.

Postmarketing Experience

The following events have been reported spontaneously from worldwide postmarketing experience:

- *Body as a whole:*
 - hypersensitivity reactions, anaphylactoid reactions, serum sickness
- *Central and Peripheral Nervous System disorders:*
 - confusion, hallucinations, taste disorders
- *Hepato-biliary disorders:*
 - abnormal liver function test, hepatitis (non-infectious), acute liver failure
- *Platelet, Bleeding and Clotting disorders:*
 - cases of bleeding with fatal outcome (especially intracranial, gastrointestinal and retroperitoneal hemorrhage)
 - agranulocytosis, aplastic anemia/pancytopenia, thrombotic thrombocytopenic purpura (TTP) – some cases with fatal outcome- (see **WARNINGS**).
 - conjunctival, ocular and retinal bleeding
- *Respiratory, thoracic and mediastinal disorders:*
 - bronchospasm, interstitial pneumonitis
- *Skin and subcutaneous tissue disorders:*
 - angioedema, erythema multiforme, Stevens-Johnson syndrome, toxic epidermal necrolysis, lichen planus
- *Renal and urinary disorders:*
 - glomerulopathy, increased creatinine levels
- *Vascular disorders:*
 - vasculitis, hypotension
- *Gastrointestinal disorders:*
 - colitis (including ulcerative or lymphocytic colitis), pancreatitis, stomatitis
- *Musculoskeletal, connective tissue and bone disorders:*
 - myalgia

OVERDOSAGE

Overdose following clopidogrel administration may lead to prolonged bleeding time and subsequent bleeding complications. A single oral dose of clopidogrel at 1500 or 2000 mg/kg was lethal to mice and to rats and at 3000 mg/kg to baboons. Symptoms of acute toxicity were vomiting (in baboons), prostration, difficult breathing, and gastrointestinal hemorrhage in all species.

Recommendations About Specific Treatment:

Based on biological plausibility, platelet transfusion may be appropriate to reverse the pharmacological effects of PLAVIX if quick reversal is required.

DOSAGE AND ADMINISTRATION

Recent MI, Recent Stroke, or Established Peripheral Arterial Disease

The recommended daily dose of PLAVIX is 75 mg once daily.

Acute Coronary Syndrome

For patients with acute coronary syndrome (unstable angina/non-Q-wave MI), PLAVIX should be initiated with a single 300 mg loading dose and then continued at 75 mg once daily. Aspirin (75 mg-325 mg once daily) should be initiated and continued in combination with PLAVIX. In CURE, most patients with Acute Coronary Syndrome also received heparin acutely (see **CLINICAL STUDIES**). PLAVIX can be administered with or without food.

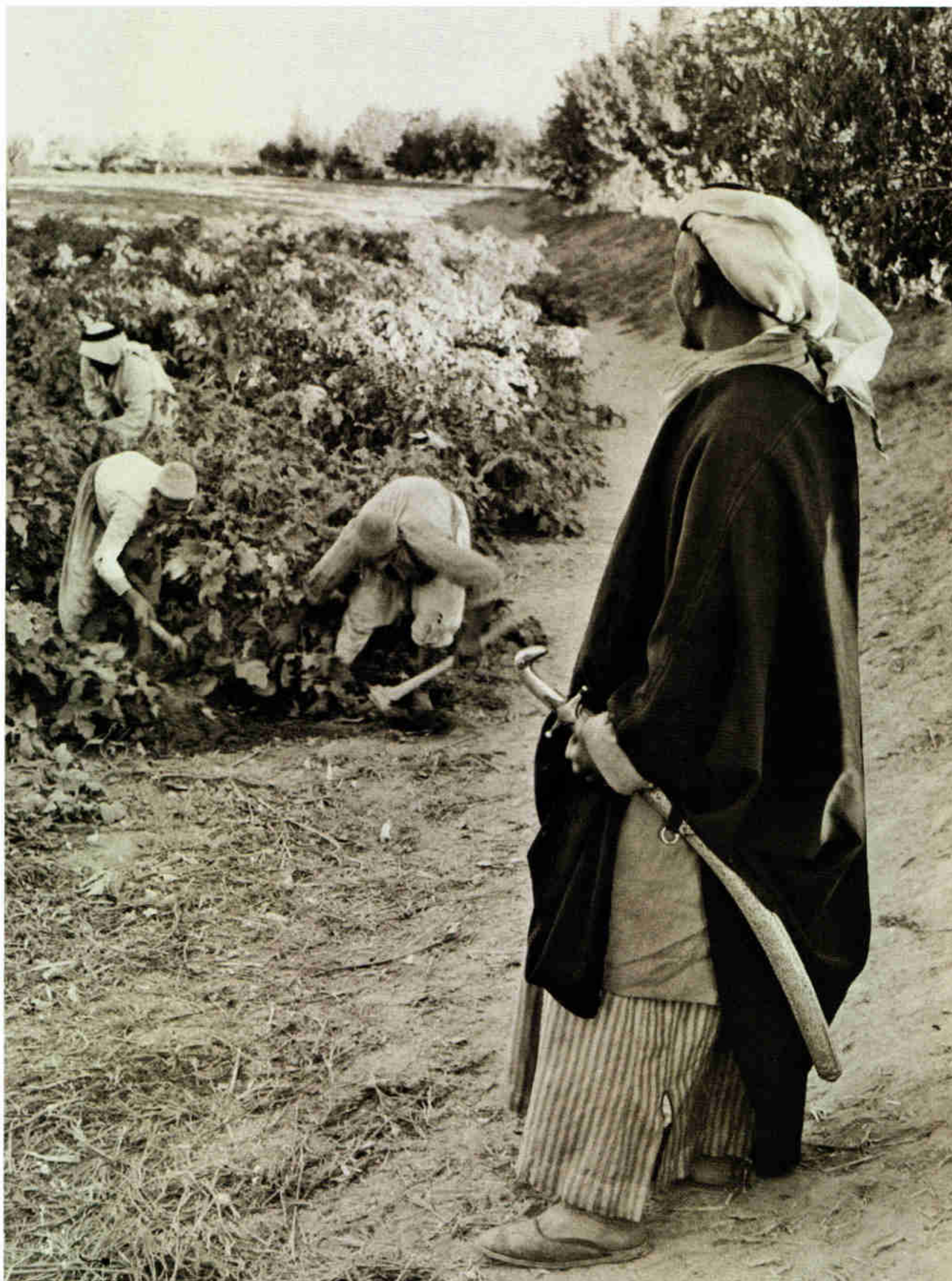
No dosage adjustment is necessary for elderly patients or patients with renal disease. (See **Clinical Pharmacology: Special Populations**.)

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Brief Summary of Prescribing Information May 2005

PLA-MAY05-B-Ae



BLACK STAR

Complete with sword, an Arab farmer supervises his workers. In isolated Arab farm communities a semifeudal economy prevails, but other areas have been quick to adopt Western improvements. Capital acquired by selling acreage to immigrants has enabled many Arabs to irrigate their remaining lands. In the Smaria Hills, Arabs terrace their land as farmers did here in biblical times, and as the more modern Jewish farmers around Jerusalem are doing again for their vineyards.



2005—Tom Avery celebrates with his team after successfully re-creating Robert E. Peary's disputed record run to the North Pole in 37 days.

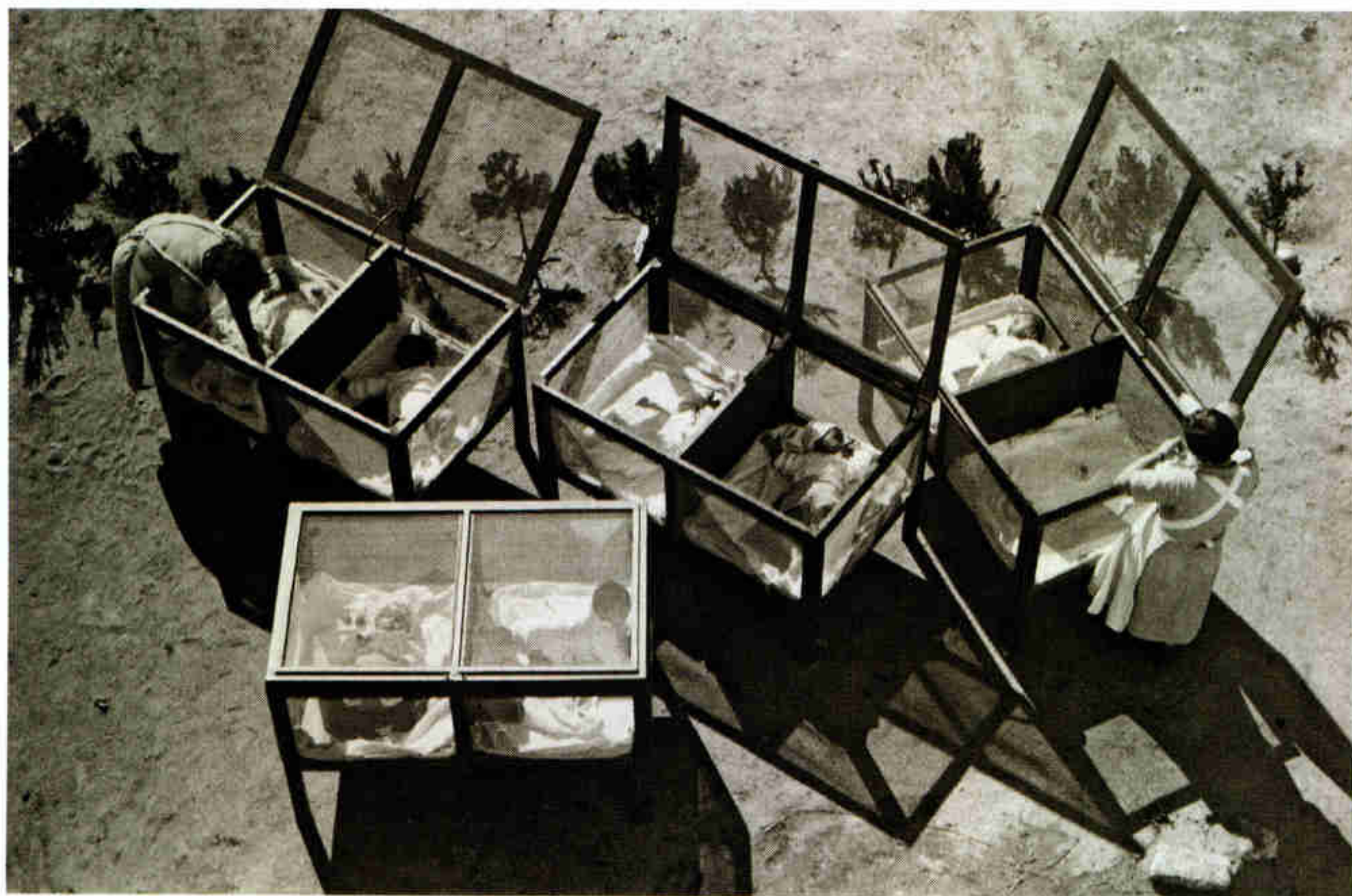
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Have your passion and discipline led you to an unprecedented achievement? If so, you could be qualified to win a trip for two through **National Geographic Expeditions**. To enter, submit a 100-word essay outlining how you reached an important personal goal. Whether scaling a mountaintop or finishing a proverbial finish line, we want to hear your story. As a selected winner, your story will also appear in an upcoming issue of *National Geographic* magazine. For contest details and complete rules, visit www.ngm.com/promotion/ghmumm.

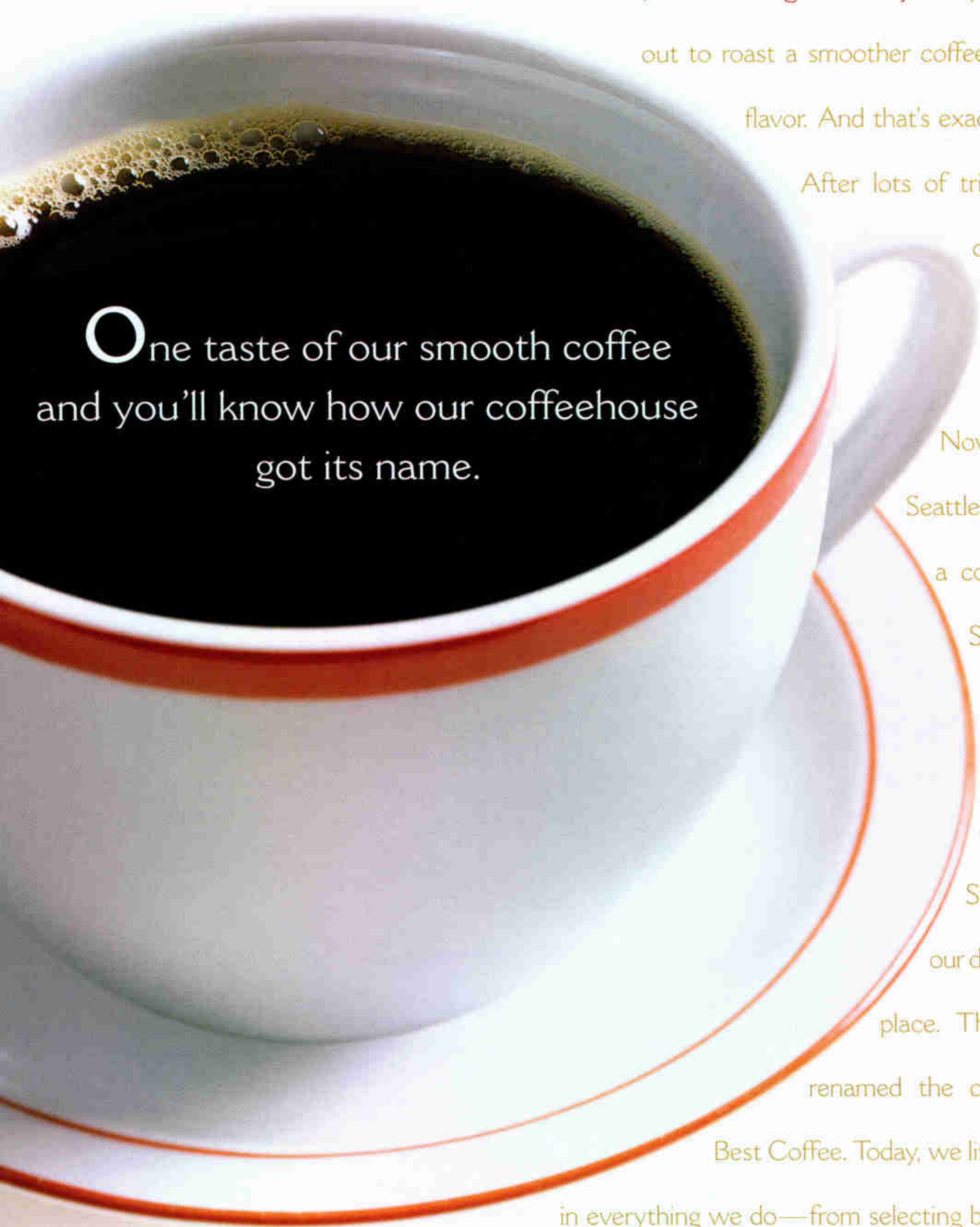
NO PURCHASE NECESSARY. A PURCHASE WILL NOT INCREASE YOUR CHANCES OF WINNING. Open only to legal residents of the U.S., excluding Puerto Rico, 18 years or older at time of entry. Employees of G.H. Mumm and National Geographic Society and their affiliates, subsidiaries, agents, and parents and their immediate families or persons living in the same household of such individuals, are ineligible. Contest begins October 15, 2005, at 12:00 a.m. EDT and ends December 31, 2005, 11:59 p.m. EST. Entries must be submitted by e-mail to NGMAdvertising@ngs.org and received by 11:59 p.m. EST or on paper by U.S. mail and postmarked by December 31, 2005, and received by January 6, 2006. LIMIT ONE ENTRY PER PERSON. To enter, send your essay, name, address, telephone number, and e-mail address to either NGMAdvertising@ngs.org or mail the same information on paper by U.S. mail to "Passion for Achievement" Contest, 711 Fifth Avenue, 17th Floor, New York, NY, 10022. Attn: Mary Hungness. Only e-mailed or U.S. mailed entries will be eligible. The essay must be an original and must comply with the Essay Requirements, as defined in the Official Rules. Entrant must be the sole copyright owner of the essay. Essays will be judged in two rounds. Judges will use the following criteria to select a winner: (1) How closely essay content aligns with the theme of G.H. Mumm's marketing campaign "Passion for Achievement": profiling amazing personal achievements, discovering how far people push themselves to achieve their goals, and overcoming all obstacles to reach a seemingly unsurmountable personal goal 50% (2) Essay fully describes what the personal achievement was and demonstrates the level of difficulty of the goal and the complexity of the process in reaching the goal 25% and 3) Style and composition of essay 25%. One (1) Grand Prize winner and their guest will attend a 2006 National Geographic Expeditions Trip—exact destination to be determined (ARV: \$6,000). CONTEST IS VOID WHERE PROHIBITED BY LAW. Sponsor: National Geographic Society, 1145 17th St., N.W., Washington, D.C. 20036. The odds of winning depend on the number of entries received. To obtain complete Official Rules go to www.ngm.com/promotion/ghmumm.



Nurses at Kibbutz Naan care for babies (above), while mothers work in fields. On the typical communal farm, teachers supervise children, and dietitians select meals. Parents see their children only after work and before dormitory bedtime. In Jericho Arab boys carry bananas (below). Old Jericho, where “the walls came tumbling down,” is a mound of ruins covering 18 settlements, the oldest dating back to 5000 B.C. New Jericho, an Arab settlement, lies about a mile away.



KEREN HAYESOD, LTD. (TOP); AP/WIDE WORLD PHOTOS



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W. ROBERT MOORE

Westernized Haifa's streamlined balconies stretch for sea breezes. Jews have lived in Haifa since biblical times, but the city slumbered until their brethren returned from 2,000 years in exile. They brought with them tastes and techniques acquired in the West, and their designers have built a shiny, airy, modernistic world of venetian blinds, electric refrigerators, and porcelain fixtures. In 1933 Haifa's primitive harbor was modernized to accommodate the Iraqi oil pipeline.



Northern Fur Seal (*Callorhinus ursinus*)
Size: Head and body length, 129 - 189 cm
Weight: 40 - 230 kg
Habitat: North Pacific Ocean; breeding grounds are in the Pribilofs, the Commander Islands and off the shore of California
Surviving number: Estimated at 8,000 on San Miguel Island, 628,000 in the Pribilofs and 442,000 at Russian rookeries

Photographed by Joel Sartore

WILDLIFE AS CANON SEES IT

Home salty home. The northern fur seal is born to the water; after a first few days close to their mothers on land, pups dive right in. The ocean serves as a vast dining room, providing a smorgasbord of fish to feed on. It is a bedroom, too, where the marvelously buoyant seal sleeps floating on its back. Only during breeding season is land at a premium; bulls aggressively defend territories of several square meters. Vulnerable to human

hunters, populations suffered greatly until controls were strengthened in the early 20th century. Even with hunting largely removed from the picture today, disease and food-chain imbalances remain dire threats.

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Bear Essentials

A polar bear's den—from the inside out

“I looked inside very carefully to make sure no one was home,” says photographer **Norbert Rosing**. He captured this bear's-eye view of a “day den” in Canada's Wapusk National Park on western Hudson Bay.

Day dens are dug quickly by mothers to shelter their cubs from nasty weather as they make their way from birthing dens toward the bay to hunt seals. “Sometimes dens have a second or third chamber that might be occupied,” says Norbert, “but not day dens like this one.” Good thing. Since he stands over six feet tall, Norbert had to crawl into the den, which would have made a speedy escape a bit tough.

Inside he saw traces of the architect. “I could see claw marks the female had made in the walls while she dug.”

He's seen a lot more than claw marks during his 17 years of photographing Arctic wildlife. This assignment in Wapusk presented special challenges. At nearly 4,500 square miles the park is essentially roadless and predominantly peat bog—ideal for polar bear birthing dens but rotten for a gear-laden photographer on foot. On summer days Norbert endured hordes of biting insects and endless soggy terrain that was almost impassable. “In some places it took me three hours to walk one mile.”

Three to four feet high and five feet deep, this unoccupied temporary den dug by a female polar bear could shelter cubs against bitter winds and wolves.

CONTRIBUTORS



Photographer John Stanmeyer catches a self-portrait, a trim, and a moment's peace at a barbershop in Kabul, Afghanistan.

GLOBAL AID

As a photographer who has documented social issues in more than 30 countries, **John Stanmeyer** has seen his share of pain. But nothing prepared him for what he saw in Uganda, Iran, Afghanistan, and Indonesia while covering global aid. The tsunami damage in Indonesia "was beyond anything I've ever tried to grasp," he says. "A camera couldn't even remotely record the magnitude of the devastation." John's emotional response took an unexpected twist. "This was the first time I haven't felt angry while working on a story related to such staggering human loss," he says. "With the tsunami, who was there to blame?"

HURRICANE KATRINA

Blame, anger, and grief flowed freely in Katrina's wake. "It felt like a crime against humanity," says writer **Chris Carroll**, who

saw people sicken and die at the New Orleans Convention Center. (You can read his story at ngm.com/0512.) There he met Willie Mae Davis and her family, who helped care for others before being evacuated to Fort Smith, Arkansas, where they were taken in by nuns. When Chris visited the family in Arkansas, Willie Mae's daughter Dana and her partner, Larry, asked him to drive them to the local courthouse, where they officially got married after 17 years of living together. "I think they felt closer after going through this terrible ordeal," says Chris—who shot the wedding pictures.

BUDDHA RISING

Writer **Perry Garfinkel** began his coverage of Buddhism with a Zen group meditating at the Auschwitz-Birkenau death camp in Poland. "The idea was to bear witness to the suffering that occurred there from a Buddhist perspective—without judgment or anger," says

Perry, a longtime practitioner of Buddhist meditation who was raised Jewish and is half Polish. "It was the most difficult and moving experience of my life."

GRAND CENTRAL

For her story on New York's commuter hub, writer **Susan Orlean** arrived on July 7—the day of the London subway and bus bombings. "Grand Central was essentially in lockdown," she says. Even so, the trains kept moving, "symbolic of the vitality and purposefulness of the city." From its basement in the bedrock of Manhattan to the balcony restaurant where she held her wedding rehearsal dinner, Susan loves this public space, where "people flow in and out, an ever renewed community that forms every minute."

TALES FROM THE FIELD

Find more stories from our contributors, including their best, worst, and quirkiest experiences, in Features at ngm.com/0512.



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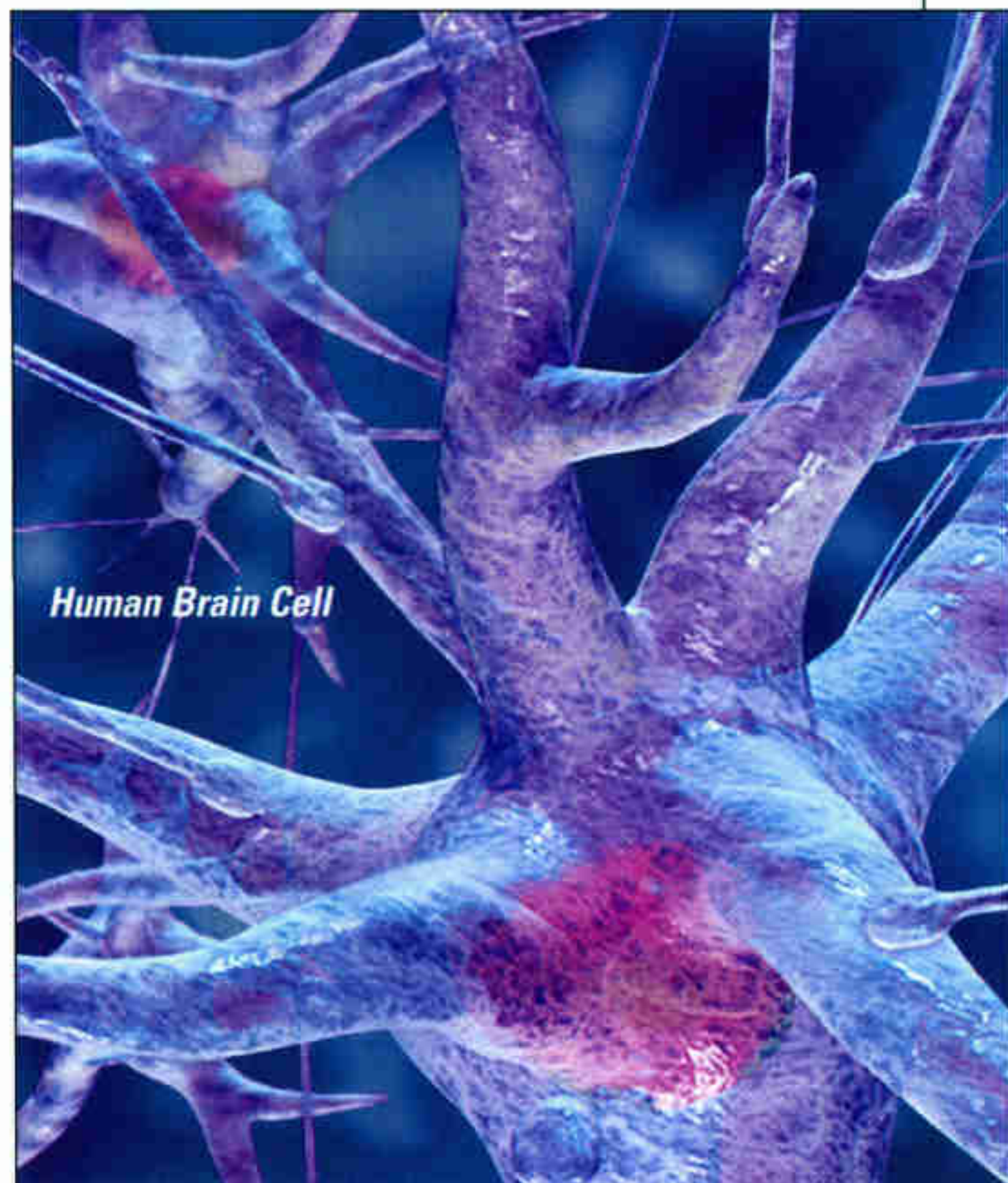
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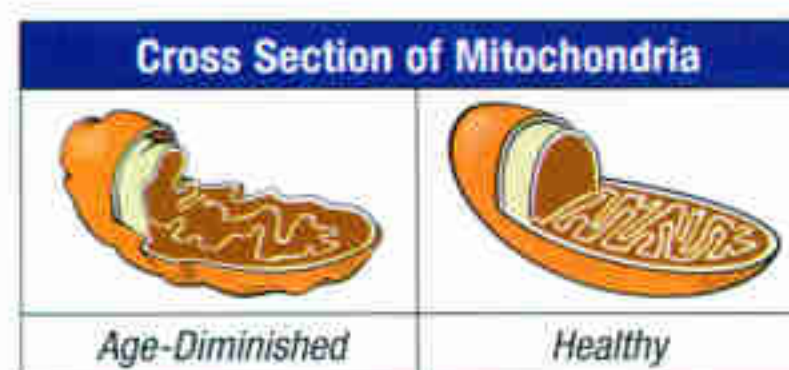
The Science of Aging.

Today scientists are attempting to challenge fate by investigating the secrets of aging. Dr. Bruce Ames, a renowned geneticist, leading biochemist and University Professor has been instrumental in researching the relationship between diet, maintaining healthy cells, and the aging process. His research links aging to tiny structures found inside cells called mitochondria.

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Going to the Dogs

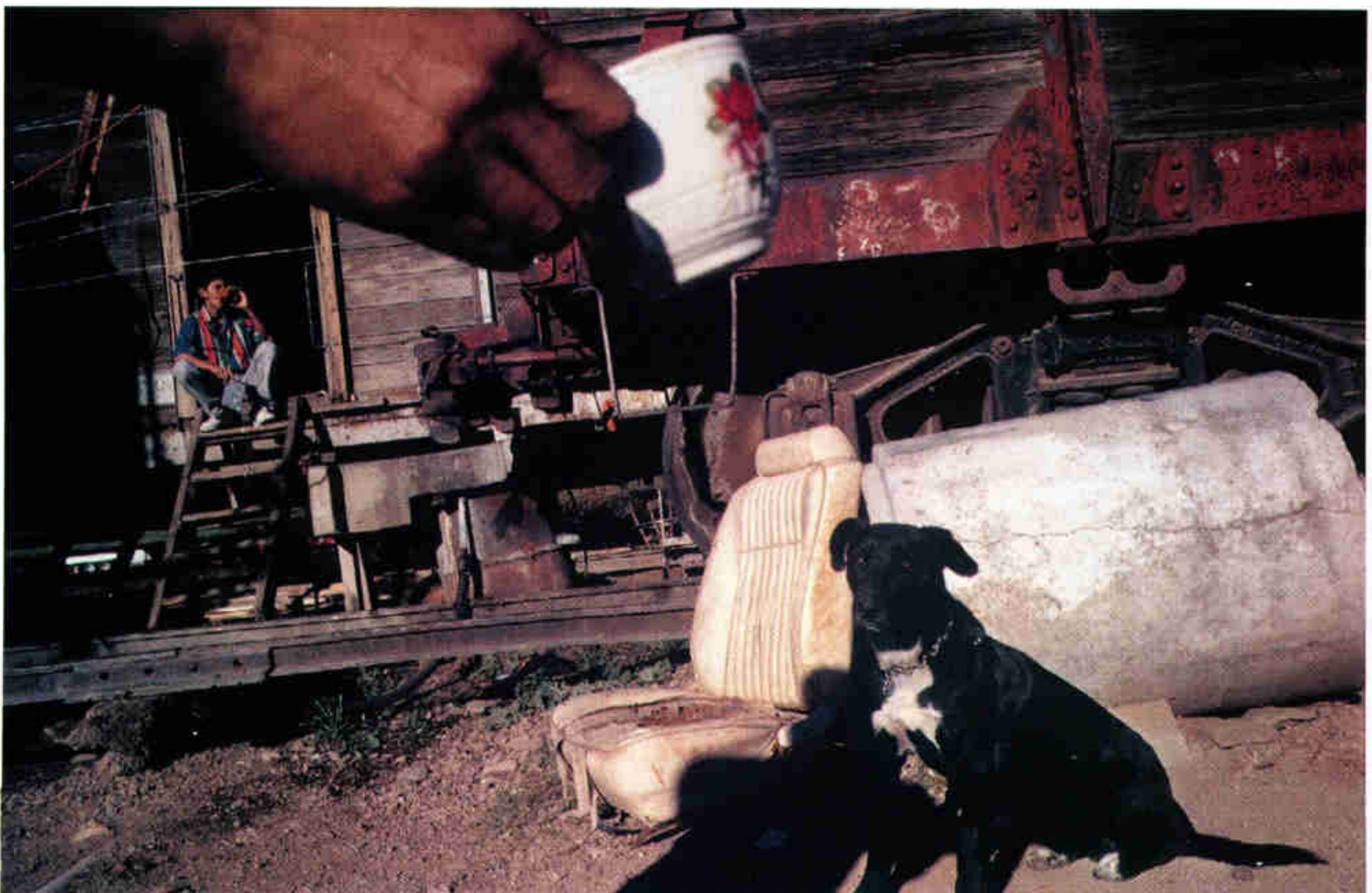
A stray dog basking in a patch of sun, a German shepherd barking from a rooftop, a lonely mutt ambling empty streets—dogs of all stripes keep finding their way into the viewfinder of photographer **Alex Webb**. In the past three decades Alex's assignments have carried him all over the world, and he's taken a few hundred photos of canines. "I don't set out to photograph dogs," he says, "but as a street photographer I often come upon them, especially in Latin America and the Caribbean."

How do dogs react to having their pictures taken? "Sometimes they're startled by my suddenly popping up near them with a camera. Other times they ignore me," Alex says, adding he's never been bitten while in the field. He also admits he's not an avid dog lover and has never owned a dog, even as a kid. So what drives his curiosity about canines? "I'm interested in the relationship of the dog to the place it's in and to what's going on around it," he says. "Often the dog looks lonely. Maybe I'm a little lonely too."

► View more of Alex Webb's photographs at ngm.com/0210/feature6.



NAPPING IN A CITY PLAZA IN OLD HAVANA, CUBA



An abandoned train car is home to man and dog in Nogales, Mexico.

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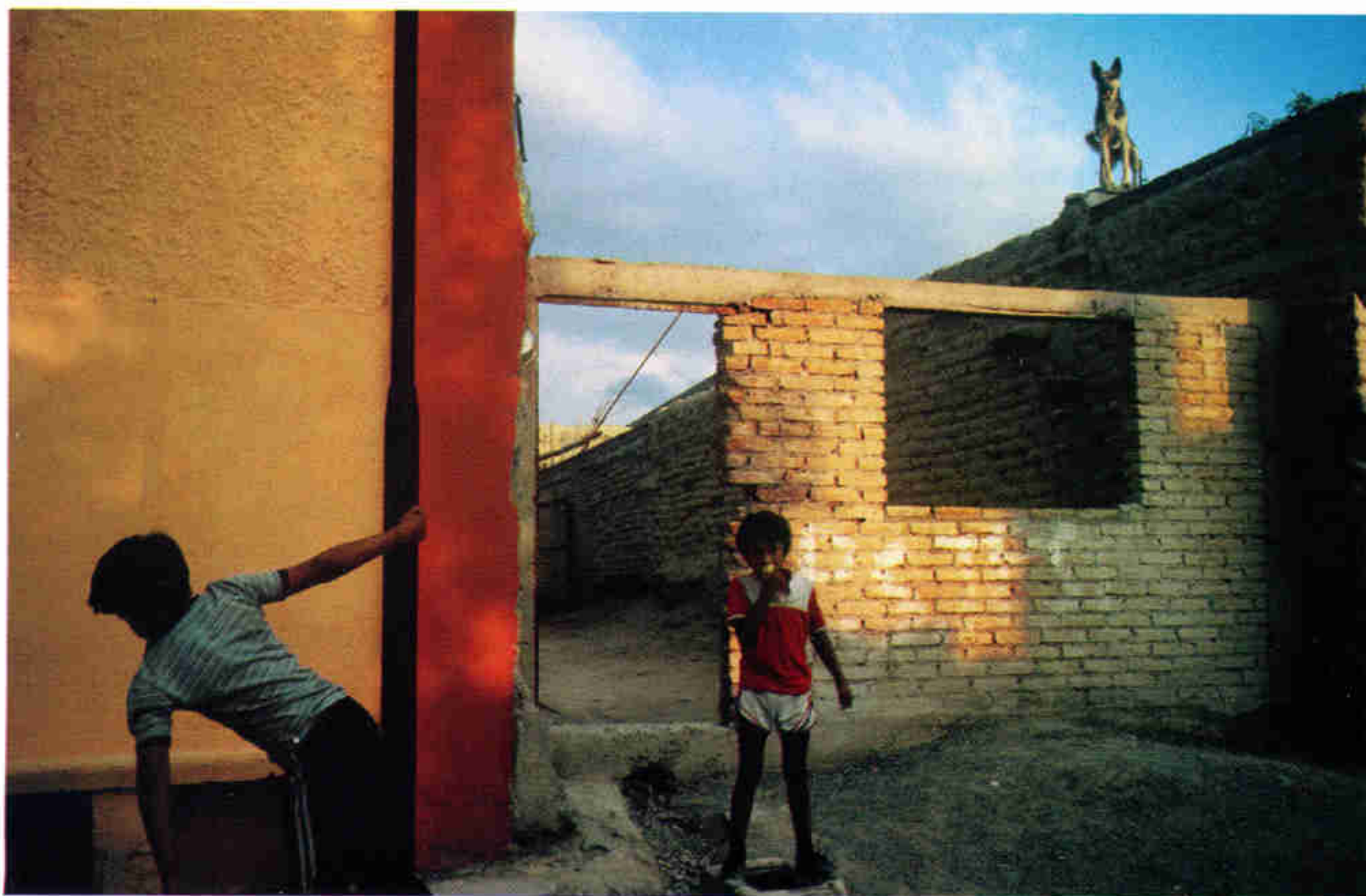
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<p>Air Bag System • Diagnostic Status: Complete. • No action needed. More information</p>	<p>Mileage: 4,538 • No action needed. We will notify you when due for maintenance. More information</p>
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No Issues Found Action Suggested Immediate Attention

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A siesta moment in Guanajuato, Mexico



A guard dog keeps an eye on children playing in Saltillo, Mexico.



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One of Mexico's many street dogs prowls downtown Nogales.



A lone dog has the early morning fog to himself in Apalachicola, Florida.

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Petting time on a family porch in Casablanca, Cuba

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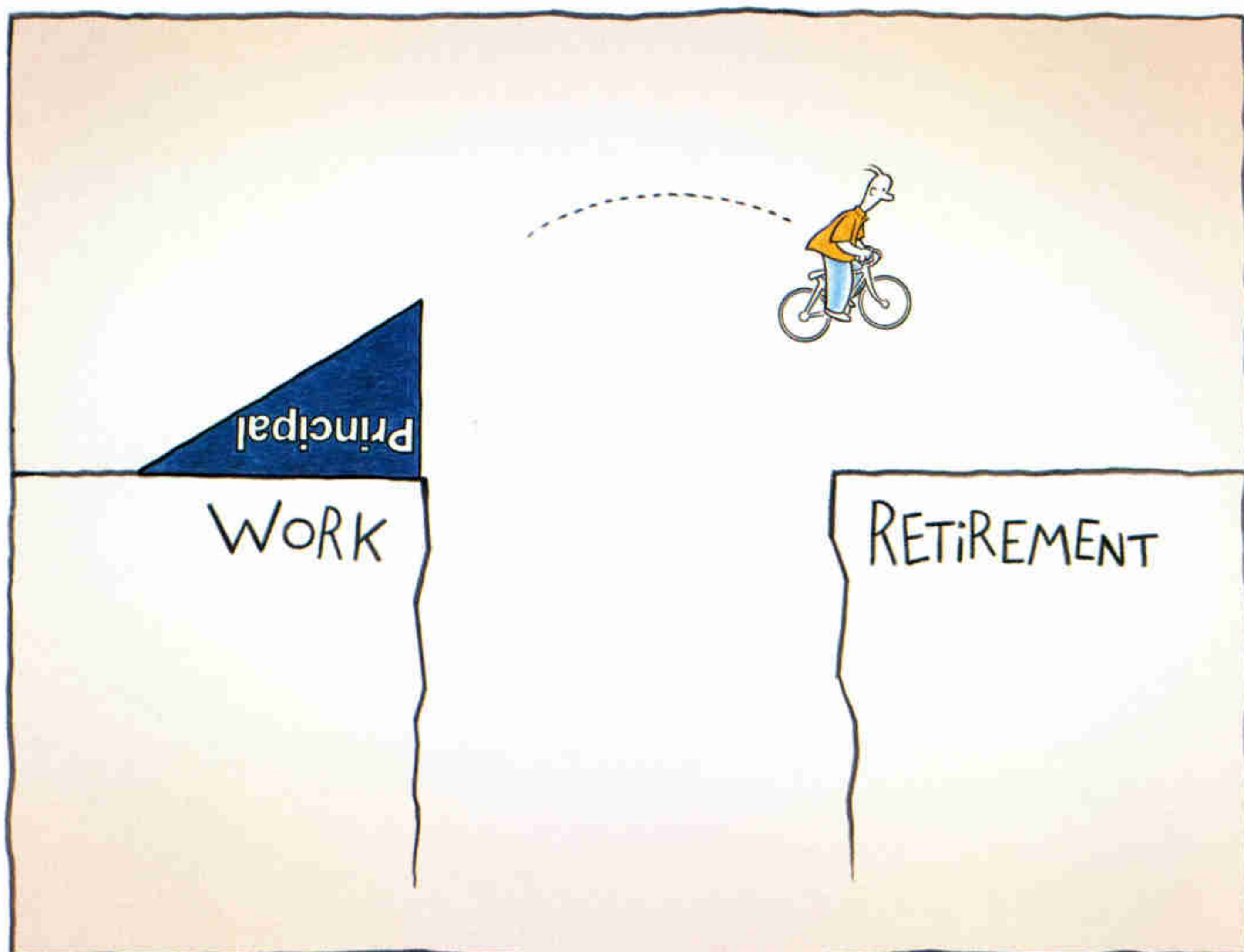
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Who Knew?

ZOOLOGY

You're One in a Million to Me

How do animals tell each other apart?

Let's say you're trying to go to sleep and are counting sheep. (Never mind that counting sheep is hopelessly old-fashioned, like wishing upon a star. We're just trying to get a column rolling here.) You are likely visualizing some generic sheep hopping a generic fence between generic pastures. The sheep have been mass-produced at the Countable Sheep Factory.

But if you're a shepherd, or a reader of science journals, you know that sheep have unique facial features. Moreover, they have specialized neural systems for recognizing faces. Research has shown that sheep can remember 50 other sheep faces for more than two years.

Animals have to be good at identifying their kin, because they want to advance the evolutionary cause of their genes. But in some cases they have a contradictory need—to blend in. No one wants to be conspicuous when a predator comes growling into town. Zebras don't have stripes just to identify one another, they have stripes in order to confuse large cats who want to kill them. When attacked, zebras run in every direction, and the stripes make



the predator feel like it's had too much cough medicine.

The study of how animals have come to look the way they do is loosely known as *evo devo* (which stands for evolutionary developmental biology). A key lesson is that creatures see the world differently than we do. This isn't a matter of philosophy: They literally see colors we can't see.

Many birds, including starlings and parakeets, can see plumage that reflects color only in the ultraviolet part of the spectrum—wavelengths that we can't see. That bland-looking starling in your yard has a secret flamboyant life in the ultraviolet.

"We were judging the importance of plumage based on human perception," says Sean Carroll, a biologist at the University of Wisconsin and the author of *Endless Forms Most Beautiful: The New Science of Evo Devo*. "It turns out there's a whole world we can't perceive."

Animals have all kinds of tricks for figuring out who is who. In dense canopies birds identify each other via song. Penguins on islands off the coast of South Africa and Namibia have black spots on their chests that are as unique as fingerprints. Lee

Dugatkin, who studies animal behavior at the University of Louisville, says, "If you asked penguins about us, they would probably say, 'two arms, two legs, faces pretty much the same.'"

Even humans have powers of perception that go beyond the visual. It turns out that our search for a mate is governed in part by odors. The evidence comes from something called the Sweaty T-Shirt Experiment.

Volunteers wear T-shirts for many days without showering. Then test subjects smell the shirts and answer questions, including "How attractive is this person?"

Results indicate that we tend to like the odor of someone who is dissimilar to us in a certain complex of genes involved in disease resistance. We seek to fill a genetic gap, of sorts—kind of like you're a mumps-resistant person, and you subconsciously desire someone resistant to measles.

The larger point here is that there are many ways to perceive the world, and some of them are unconscious. Maybe someday science will discover that we tend to pick mates who look lovely in the infrared.

—Joel Achenbach

WASHINGTON POST STAFF WRITER

HOPE IN HELL

**FROM THE GULF COAST
TO UGANDA—
THE REACH OF
HUMANITARIAN AID**

DEVASTATION Ohio National Guardsmen patrol the Louisiana Superdome, where five days after Hurricane Katrina made landfall, Robert Dick and hundreds of other homeless New Orleanians still waited to escape the city. For evacuee Robin Blunt (facing page), prayers mixed with tears during a worship service in a San Antonio shelter.

KUNI TAKAHASHI, CHICAGO TRIBUNE;
MATT SLOCUM, ASSOCIATED PRESS (OPPOSITE)



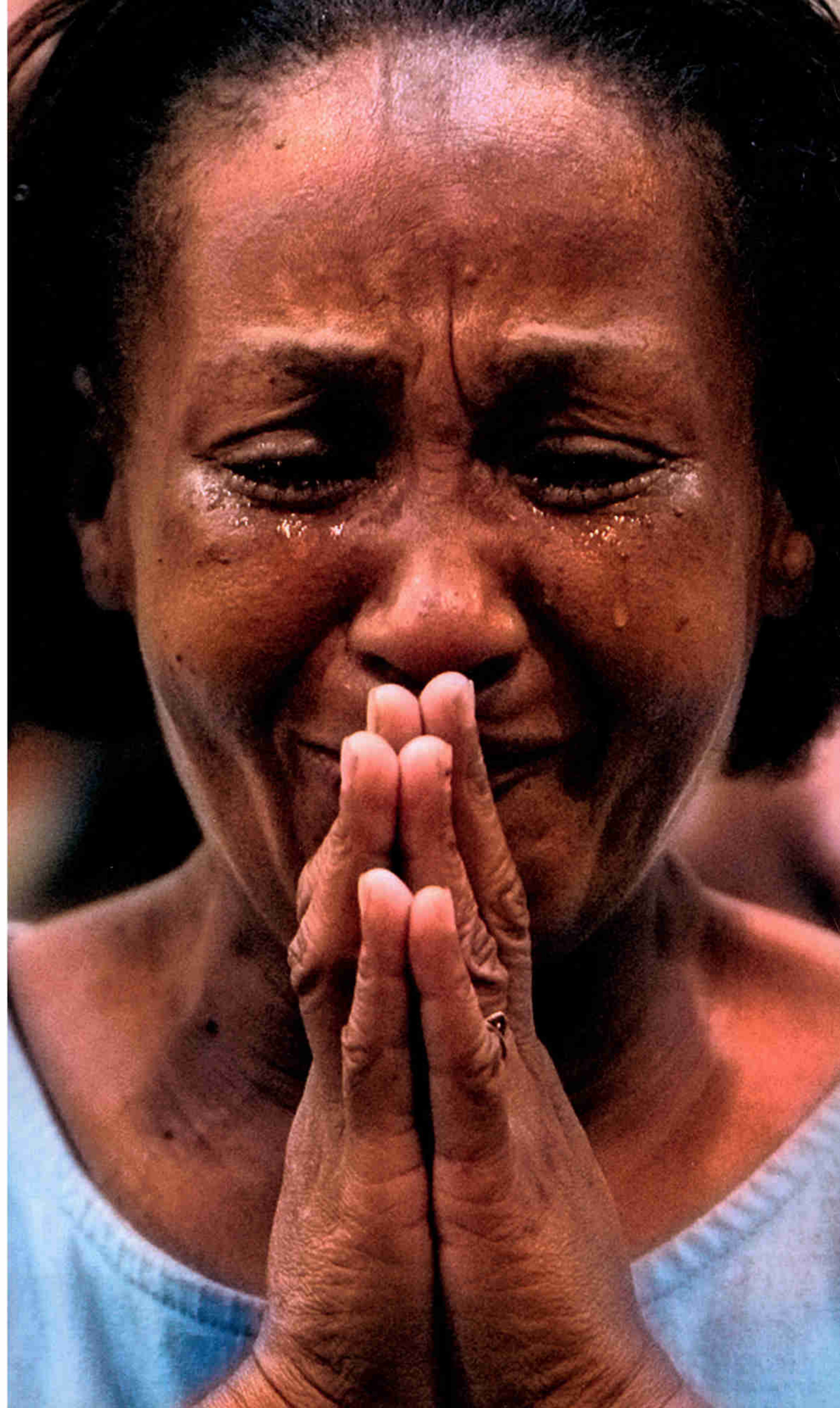
DEADLY DELAY

KATRINA: GRASPING FOR RELIEF

When Hurricane Katrina slammed into the Gulf Coast on August 29, 2005, a world accustomed to global projections of American power—including international relief efforts after such disasters as the 2004 Asian tsunami and the 2003 earthquake in Bam, Iran—witnessed that same power reduced to impotence.

Certainly what happened later was more comforting. In the month after Katrina devastated a swath of Louisiana and Mississippi (with Rita not far behind) tens of billions of dollars of emergency aid appropriations were rushed through Congress. Convoys of aid flowed south. People pledged over a billion dollars to the Red Cross.

But the fact that the nation's aid mechanisms eventually seemed to get on track doesn't erase the disgrace of the first week after the storm, when people without food or water suffered and died in a major metropolitan area and when government emergency managers and aid organizations couldn't deliver relief. Katrina behaved exactly like the monster storm scientists and local officials knew would one day drown New Orleans (they'd even practiced with a model storm a year before). The death trap the Big Easy was allowed to become is likely to redound to the U.S.'s discredit for years.





HOPING FOR HELP Vera Smith's body lay for days on the New Orleans sidewalk where she died, killed by a hit-and-run driver. Neighbors covered the great-grandmother's remains with a makeshift tomb of tarp-covered dirt and bricks. Estelle Dowl (below), daughter Cayla, and son Nathaniel waded through floodwaters to the Superdome, a "shelter of last resort."





FIRST RESPONSE Even with many of their own homes and three-fourths of the city's firehouses underwater, New Orleans firefighters struggled to protect their neighbors—like this elderly woman rescued from her home. Emergency plans projected that after a major hurricane, firefighters would have to function without outside help for as long as 72 hours. "Our guys," department chief Charles Parent said, "went way beyond that."

MARIO TAMA, GETTY IMAGES



BY CHRIS CARROLL
NATIONAL GEOGRAPHIC WRITER

Labor Day morning in Houston (seven days after Katrina) saw volunteers jammed elbow to elbow behind steam tables, shoveling eggs, sausage, and potatoes. There were so many people helping that the effort to feed the quiet, traumatized people from flooded New Orleans, bused to shelter at the city's convention center, seemed almost like a competition. One American city was trying desperately to rescue another. Red Cross officials on local talk radio begged Houstonites to stop bringing food donations to the major shelters because they were blocking giant aid shipments from local corporations. A frustrated restaurateur trying to get 500 pizzas to displaced children in the Astrodome couldn't find a way to deliver them.

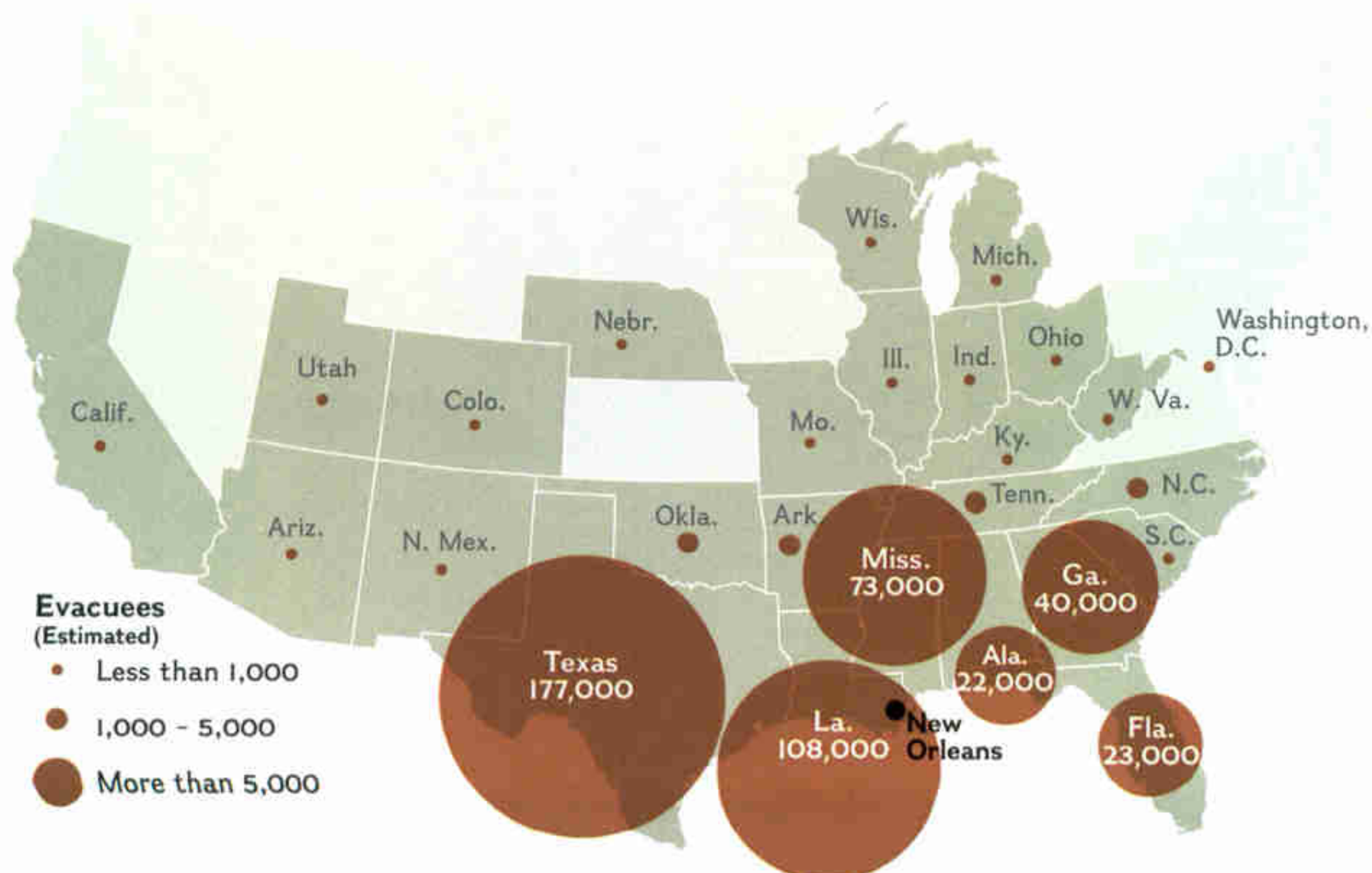
I'd just arrived in Houston from New Orleans. As I waited to check in at my downtown hotel, I met a refugee whose family had, that morning, been helped by a wealthy woman to move from a shelter into a brace of suites at the hotel. The family was now preparing to move to two apartments—the first few months rent paid for by the same woman.

Hearing that story was like breathing clean air for the first time in days. I had driven alone from New Orleans, but the disgust and sadness at what I had seen there felt like passengers in the truck with me. People go to jail, I kept thinking as I drove west on I-10, for keeping animals in conditions the same as those endured by tens of thousands of people trapped for days at the Superdome and the Convention Center in New Orleans.

I'd had my first glimpse of rescue gone awry on Friday, September 2,

SCATTERED LIVES

War, natural disaster, and economic collapse have all forced Americans from their homes in the past, but never have so many been displaced so quickly. The dots below show numbers of evacuees in Red Cross shelters—or in hotel rooms paid for by the Red Cross—a month after Katrina.



SOURCE: AMERICAN RED CROSS; NG MAPS, ERIC GAY, ASSOCIATED PRESS (ABOVE RIGHT); MICHAEL AINSWORTH, DALLAS MORNING NEWS



HUNGRY, THIRSTY, FRANTIC New Orleans survivors rushed toward a military helicopter near the Convention Center (above), hoping to catch a dropped carton of emergency meals or bottles of water. Outside the Superdome (below) arguments erupted as residents jostled to reach buses that would carry them away from their ravaged city.





AID AND COMFORT Seventeen-year-old Texan Amanda Fowler (above, at left) gathered 16-year-old Louisiana evacuee Charleetha Lawrence into a prayerful embrace during a Sunday service at Faith Crossing Church near Dallas. In hard-hit Waveland, Mississippi, hurricane survivors waited in long lines to collect food and other necessities from relief stockpiles (below).



as I drove over the Mississippi River into downtown New Orleans. I saw a pickup headed in the opposite direction on the bridge, its cab and bed packed with perhaps a dozen men, women, and children. The pickup pulled a bass boat similarly loaded with human cargo. To me, the entourage looked like an extended family of African Americans trying to escape the metro area. Gas, food, and lodging were all available about 30 miles west.

The police on the bridge acted like the group was a potential raiding party intent on sacking Gretna, a suburb just across the bridge. “Turn it around!” a plainclothes police officer shouted as he strode purposefully toward the slowly approaching truck. The driver brought the truck to a halt and pleaded his family’s case. “TURN IT AROUND—NOW!” the officer bellowed. Several others, heavily armed, stepped up, and the driver got the message. Nearby a couple slumped against a concrete traffic barrier next to a supply-laden grocery cart they’d been trying to push over the bridge until they, too, had been turned back.

Later I saw what the people on the bridge had been trying unsuccessfully to escape. The Convention Center—now four days after the hurricane—was a kaleidoscope of human degradation festering in the late summer heat.

People had been pouring into the building since Monday. It was not until Thursday that soldiers had dumped food and water from hovering helicopters. “It’s the looters breaking into stores and bringing food and water that have kept us alive,” said a man named Brandon Jackson.

On Friday afternoon a late-model Chrysler barreled around the corner from Julia Street and headed south on Convention Center Boulevard. It jerked to a stop in front of the building, and a young man with cornrow braids wearing a giant T-shirt and baggy jeans stepped out. A young woman who rode in with him threw open the trunk, which was filled with crates of orange drink. As people from the crowd swarmed the car, she shouted that the delivery was specifically for women with young children. Where, someone asked the driver—who at that moment was eyeing a Humvee full of heavily armed National Guardsmen who had arrived that morning, apparently not to help people but to guard them—did the juice come from? The young man shrugged and said, “Mmm, just found it.”

It would be reported later that domestic and international aid shipments and professional relief workers had been stuck in airports and hotels and idling in trucks while government bureaucrats discussed how to deploy resources. The American Red Cross, meanwhile, had been ordered by the Department of Homeland Security to stay out of New Orleans. The more unpleasant the city was, the reasoning went, the more residents would want to leave—never mind if they had no way to do so.

For now, the young man and young woman were the only humanitarian aid I could see in post-Katrina New Orleans.

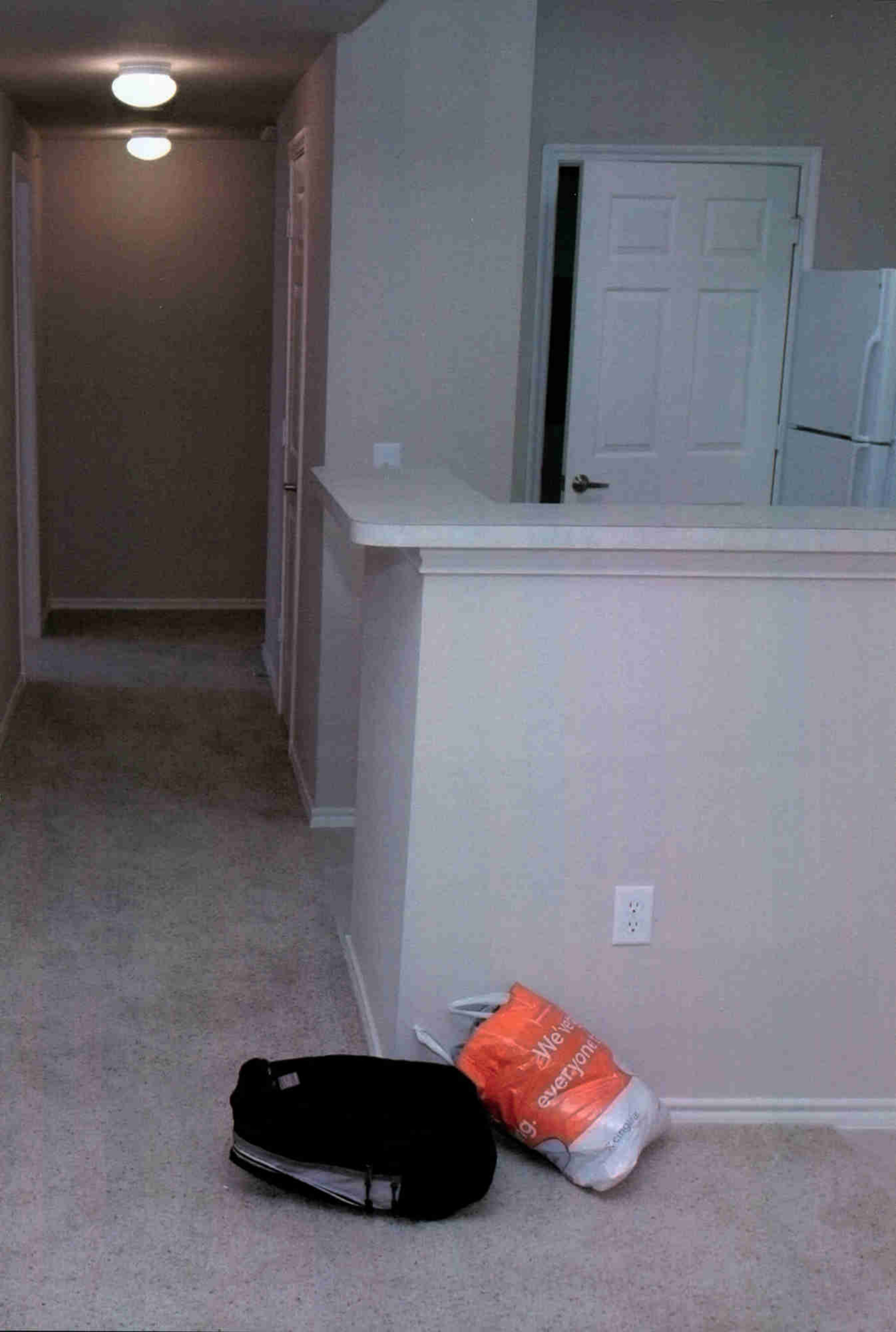
I wanted to ask them if they’d heard about the Louisiana governor’s shoot-to-kill order, delivered the previous day after news reports of thugs ruling the streets and looters stripping abandoned stores of TVs. I’d been told that the local police, at least, were looking the other way when people scavenged for necessities. Still, I wouldn’t have wanted to be in the shoes of a young black man in baggy attire in an abandoned store. But he and the girl jumped in the car and were gone before I could ask the question.

 **EXPERIENCE A POST-KATRINA RESCUE** Join NATIONAL GEOGRAPHIC writer Chris Carroll on one family’s long, difficult journey from New Orleans to Fort Smith, Arkansas, at ngm.com/0512.

A LONG WAY FROM HOME Hilda Crain was evacuated from New Orleans to Houston's Astrodome, then moved into a vacant unit in a senior-citizens apartment complex. A hurricane housing task force and a local utility promised to cover many evacuees' rent and electric bills for as long as six months. What happens when the aid runs out? For many of Katrina's victims, the future remains dauntingly uncertain. □

DAVE EINSEL, GETTY IMAGES







BY EDWARD GIRARDET PHOTOGRAPHS BY JOHN STANMEYER

When a tsunami killed more than 225,000 people along the coast of the Indian Ocean on December 26, 2004, an unprecedented global relief effort reached full throttle within days. But rebuilding Aceh, Indonesia, and other devastated areas could take a decade. After other tragedies, aid has often evaporated: Tens of thousands of people remain in shelters in Bam, Iran, where an earthquake razed the ancient city a year to the day before the tsunami. In Afghanistan, four years after coalition forces ousted the Taliban from power, relief workers increasingly risk their own lives in the still war-torn land. Meanwhile some 30,000 children must hide every night from brutal insurgents in a two-decade-old conflict in northern Uganda. One thing is certain: The media will move on to the next crisis. Then how far does humanitarian aid reach?

WHEN THE WORLD FORGETS

WHO COMES TO HELP

A Dutch physician with Doctors Without Borders comforts a dehydrated child in Uganda.



ACEH, INDONESIA

THE TSUNAMI

December 26, 2004

The world's overwhelming response

With local food sources wiped out, incoming supplies feed not just survivors but those helping them. Here troops from the U.S.S. *Essex* load soldiers' rations onto a helicopter. A dozen nations sent soldiers to the disaster zone in Indonesia. With their ability to move supplies swiftly, they saved countless lives.



As the Malaysian army helicopter lurched forward, hugging the western coastline of Indonesia's tsunami-battered Aceh Province, I clung to the half-open portal, mesmerized

by the devastation that unfolded below me. The few trees that had survived the watery onslaught of just a couple weeks ago stood like solitary sentinels along newly created shorelines and inlets. It was as if the wooden homesteads and rice fields in these Indian Ocean communities had been carefully—and diabolically—plucked up from the Earth.

For close to two miles inland the muddy land was shorn of any trace of human existence. Then, just on the other side of the “front line,” where the tsunami’s surge had run out of impetus, I could see the tiny figures of farmers tending rice fields and children playing in the mango trees.

Tony Banbury, regional director of the World Food Programme (WFP), stood beside me. Banbury’s concern was to deliver food, especially to the tens of thousands of people cut off from the rest of the country. “This means we’re going to have to bring in supplies by air or sea,” he shouted over the aircraft’s throbbing rotors, pointing to the partly submerged asphalt road that used to lace along the coast.

At least supplies were available. Within days of the tsunami, WFP had tracked down two commercial ships loaded with rice sailing up Indonesia’s Malacca Strait. For the first time since we’d met, Banbury preceded his words with a satisfied grin: “We got lucky. We were able to redirect the ships to ports for immediate distribution to survivors.”

As the helicopter swung low over the provincial capital of Banda Aceh, the khaki-clad American kept his gaze fixed on the scene below, grasping a metal frame to keep his balance. “I’ve never seen anything quite like this,” he said.

Neither had I. Certainly not broadcast on TV around the world 24-7.

I struggled to identify anything recognizable on the ground. Two years earlier I’d traveled to Aceh to report on the region’s ongoing civil war.

Now its familiar landmarks were gone, and the tiny airport was transformed by the global mobilization of human and material resources. A sprawling phalanx of military encampments had mushroomed on either side of the single runway. It looked like a Boy Scout jamboree many thousands strong: British, French, Japanese—about a dozen national flags fluttered in the warm wind. Tents stood shoulder-to-shoulder in regimented rows; others of different shapes and colors perched randomly around them. Aid workers and soldiers stacked food and medical supplies along the runway aprons, oblivious to the constant roar of Antonov transport planes, C-130s, and helicopters.

By the time I’d arrived, in mid-January, in the northern Sumatran city of Medan, a principal launching pad for the relief effort in Aceh Province, the area was swarming with aid workers, journalists, and military personnel. They’d been frantically dispatched within days of the tsunami by governments, the United Nations, and non-governmental organizations (NGOs) from around the world.

Aid organizations such as Doctors Without Borders, CARE, and the International Rescue Committee also soon found themselves competing for space with newcomers to the humanitarian relief scene. The Church of Scientology, for instance, flew in dozens of smiling young volunteers. Wearing bright yellow T-shirts, they hoisted colorful banners and tents smack in the middle of Banda Aceh. One smiling American college student raved about the amazing things the church was doing in the treatment of child trauma. Meanwhile, young Islamic militants, some wearing face masks, drove around in truck convoys. Their principal concern was to give relief, to clean mosques, and provide as many bodies as possible with proper Muslim burials.

The place teemed with a high-adrenaline



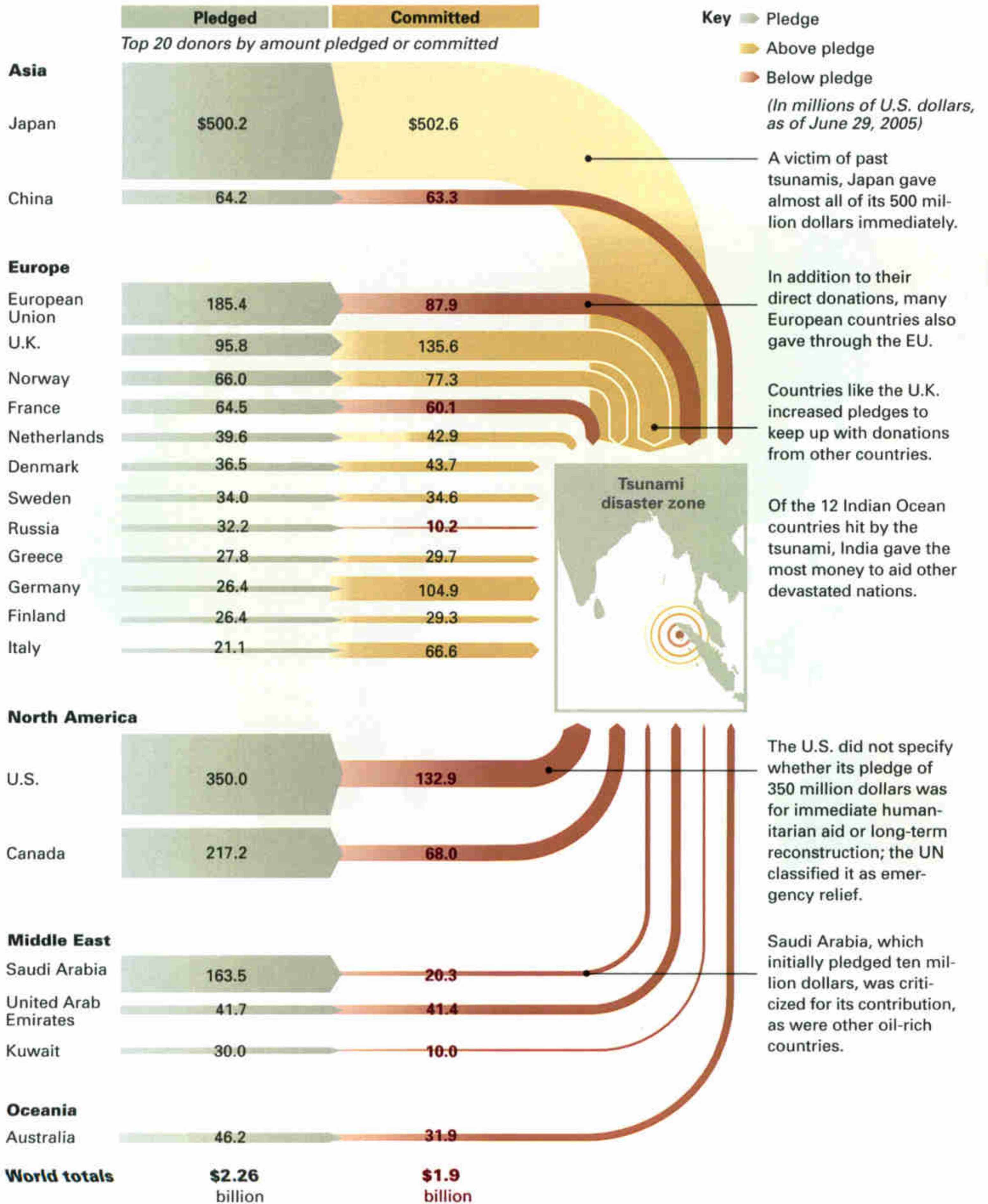
STILL STANDING Breaking an eerie silence, a U.S. Marine helicopter flies over the town of Lampuuk, a former tourist spot where the only structure remaining is the Rahmatullah Lampuuk mosque. After the tsunami tossed a fishing boat into a field (below), a hundred men and boys hired by the aid group Mercy Corps haul it back to sea.



TSUNAMI HUMANITARIAN RELIEF

HOW MUCH GOVERNMENTS GAVE

Within weeks of the disaster, governments worldwide had pledged over two billion dollars in humanitarian aid; many added more as they realized the extent of the crisis. But as of June 29, nations had legally committed 400 million dollars less than they had pledged. History suggests some will pay up; others won't.



“we’re all in this together” camaraderie. On the airport runway I watched a group of Indonesian Red Cross volunteers climb aboard a Singaporean military transport plane, exhausted yet wistful. “What I will remember most is how all these countries came here to help,” said 27-year-old Jailani, a student from Borneo. He shifted the heavy backpack on his slight shoulders and disappeared into the plane.

Not far from the tarmac, soldiers from an Australian engineering regiment worked in camouflage fatigues, hauling heavy equipment for a water purification plant that would eventually process more than 5,000 gallons an hour. Taking a break, they cracked a few jokes, then turned serious. “We’re trained for warfare,” said a corporal with short-cropped hair. “But in some ways this sort of experience is more sobering. Perhaps it makes us better human beings.”

Perhaps. But several long-term coordinators and some international relief workers redeployed from vital humanitarian efforts elsewhere, notably Africa, were resigned to the uneven allocation of international aid resources. One World Health Organization representative reminded me that the HIV/AIDS pandemic kills as many people as this tsunami every three weeks.

Even as relief workers distributed vitamin-reinforced, high-energy biscuits to hungry children, or dug latrines for emergency shelters, I heard voices raised in distress at the massive influx of aid. The existing infrastructure in Aceh Province was overburdened, there were absolutely no seats available on planes, ground

facilities overflowed with supplies, some of which—winter clothing and out-of-date medications—were inappropriate.

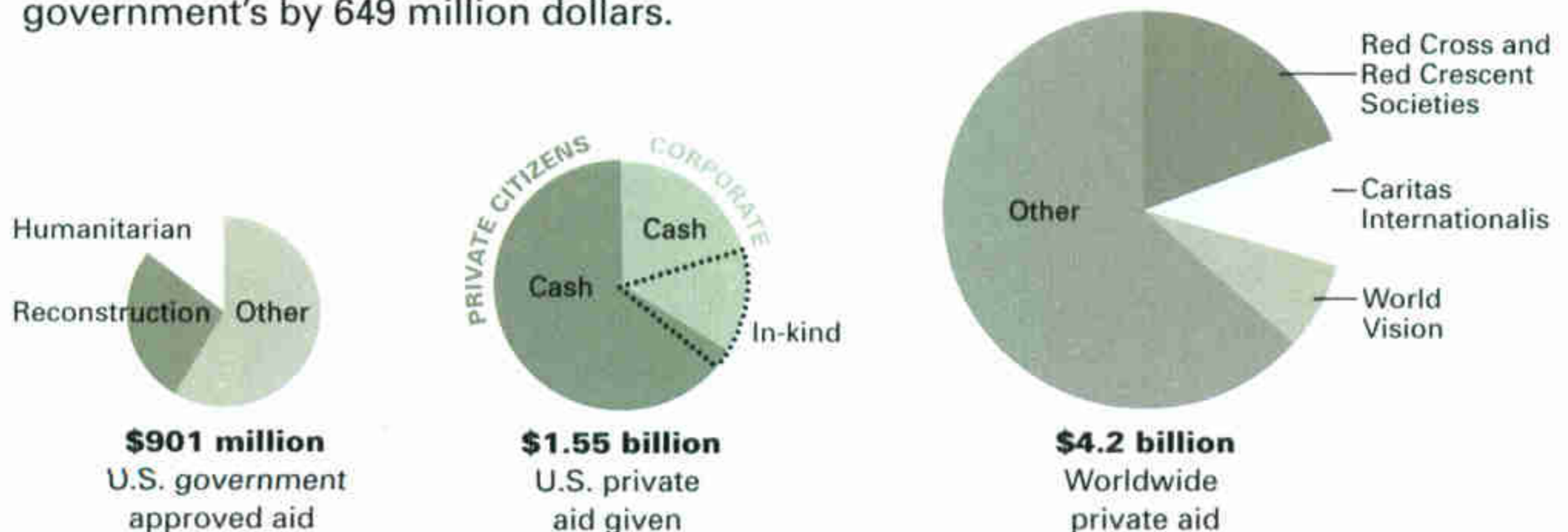
Nigel Snoad, a 33-year-old Australian who headed the UN Joint Logistics Centre in Banda Aceh, had a different complaint. “In the past 28 minutes I’ve missed 59 calls,” he said, waving his ringing cell phone. Snoad said the overkill reaction was causing enormous problems with field operations, and he baptized the flood of phone calls and the never ending inquiries from diplomats, NGOs, and volunteers Asia’s “second tsunami.” For the worn-out aid coordinator, the situation had reached “an insane level of chaos.” “When,” he asked, “is anyone going to have the guts to tell them that we have enough? That we don’t need any more?”

“It’s perfectly understandable that people want to help, but this sort of situation needs organizations with experience receiving and distributing resources,” said an agitated Danish Red Cross official. “I know this sounds harsh, but it really doesn’t help to come here or to bring things that aren’t needed. When people ask to help, we tell them the best thing is to donate money.”

They did send money. Millions around the world stayed riveted to TV screens—watching homes obliterated and bloated bodies washing up on beaches. They called 800 numbers, they logged on to emergency websites, they pledged something, anything, to help. By depicting the tsunami as an unprecedented global phenomenon, the media helped ensure that it became one of the largest humanitarian operations ever:

HOW MUCH YOU GAVE

The tsunami triggered a global outpouring of money—over four billion dollars from individuals, companies, and aid groups. U.S. private donations surpassed the government’s by 649 million dollars.





SEA OF RELIEF In the village of Calang, where the tsunami killed most of the population, victims dig through donated clothes stockpiled on the shore. Without the infrastructure to distribute such aid, the Indonesian military burned the tide-soaked clothes after a week to make room for another load of supplies.



ACEH, INDONESIA

almost seven billion dollars in emergency relief aid from private and government sources—far more than the aid organizations could ever hope to spend for that purpose.

“This shows how grotesquely skewed international humanitarian aid is toward high-profile crises,” says Jonathan Walter, the New Delhi-based editor of the *World Disasters Report*, published by the International Federation of Red Cross and Red Crescent Societies.

“Somehow, people just seem to accept that Africans are starving or getting killed. It’s no big deal,” commented Dr. Kees Rietveld, a veteran humanitarian health worker. “But when you have blond Swedish children or a Czech fashion model swept away by some tidal wave, that’s a totally different matter.”

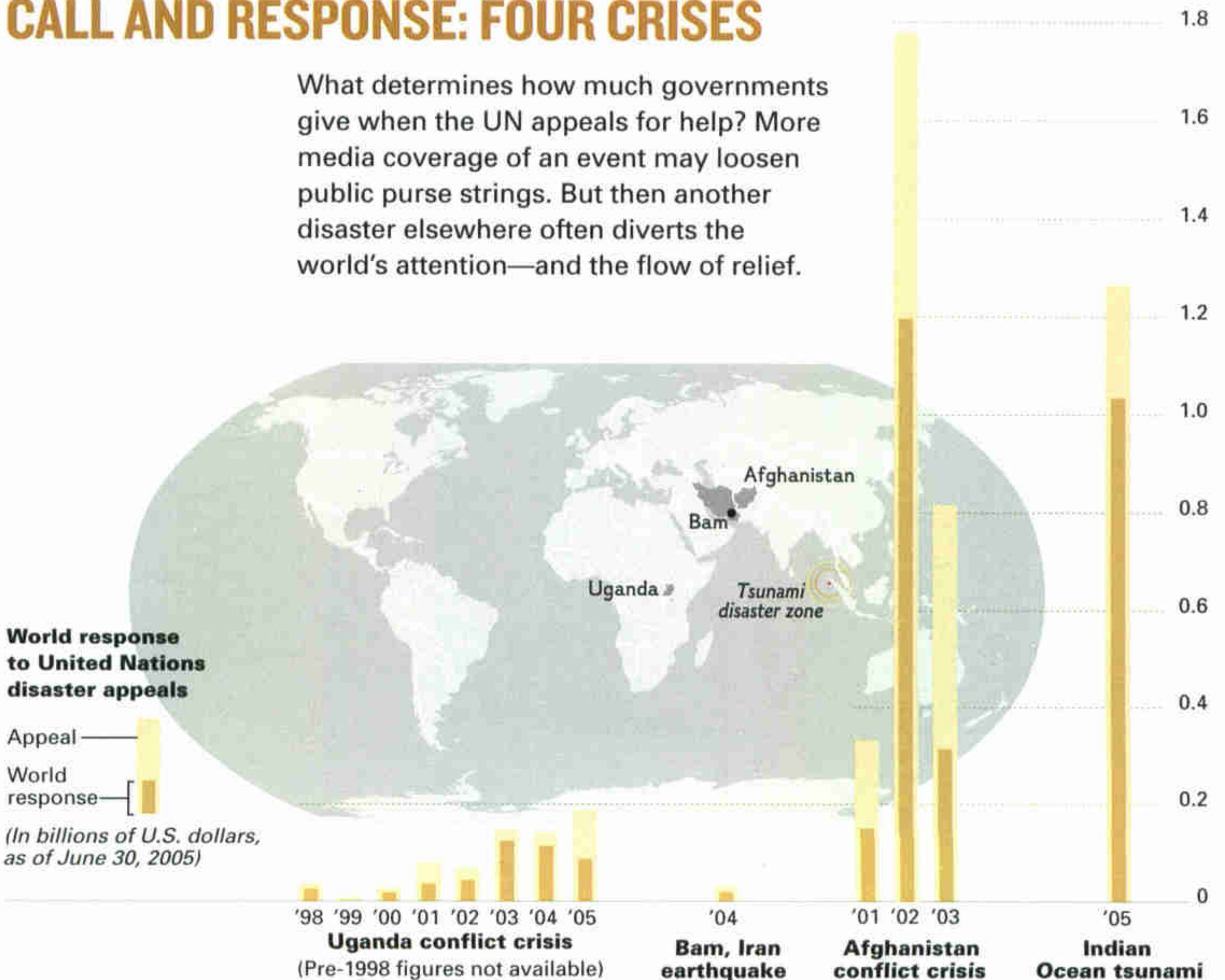
In the Democratic Republic of the Congo four million people are believed to have died since 1998—almost 98 percent in 2003 and 2004 from war-induced starvation and disease. And despite

renewed interest in Sudan’s conflict and the famine-ridden Darfur region in early 2005 (primarily the result of a political settlement between the warring north and south but also because of interest in the region’s significant oil reserves), the International Committee of the Red Cross and other agencies say responses tend to flag when media coverage dwindles. Only when widespread reports like those last summer revealed scores of children dead of starvation in Niger, did the world heed earlier warnings by the UN. Still, in early August, Niger’s President Mamadou Tandja called reports of famine in his country false propaganda by the UN.

“Humanitarian responses are a bit like a lottery,” says Jan Egeland, head of the UN’s Office for the Coordination of Humanitarian Affairs in New York. “The 30-odd crisis-ridden societies around the world play that lottery every night. But only one or two a year will win—if they’re lucky.”

CALL AND RESPONSE: FOUR CRISES

What determines how much governments give when the UN appeals for help? More media coverage of an event may loosen public purse strings. But then another disaster elsewhere often diverts the world’s attention—and the flow of relief.





BUILDING THE FUTURE Shouldering a wooden rifle, a boy keeps watch at a construction site that will house 3,000 survivors. Kaibar (below, in striped shirt) lost his home but found solace in his art. “Water dominated the children’s early drawings,” says nurse Mary Van Veen, at right. “But after a few weeks they added land and people to their pictures.”





BAM, IRAN

THE EARTHQUAKE

December 26, 2003

When promises are broken

Two years after a 6.6-magnitude quake killed 26,200 people here, only a fraction of the one billion dollars pledged in aid has arrived, leaving many survivors living in steel shelters. "There's been little support to get from relief to reconstruction," says Payman Mohajer, director of Relief International in Iran.



One year to the day before a massive earthquake under the Indian Ocean sent walls of water crashing over the shores of South Asia, another temblor shook the Earth. It happened

in the early hours of December 26, 2003. The quake registered 6.6 and took only seconds to flatten four-fifths of the traditional mud-and-brick buildings in the ancient city of Bam, Iran. Among them was 2,000-year-old Arg-e Bam, the world's largest mud citadel.

As with the tsunami, the response was immediate. Two hours after the quake, the first relief teams from the Iranian Red Crescent Society, racing in four-wheel-drive vehicles along the narrow road leading from the provincial capital of Kerman, reached the devastated city. To their surprise, much of the rural outskirts remained relatively unscathed. But as they drew closer to the heart of Bam, the damage was shocking. While some of the aid workers immediately began pulling survivors from beneath piles of rubble, others set about the crucial task of assessing the damage to determine emergency relief needs.

By ten in the morning the Red Crescent Society was holding its first emergency meetings, based on initial field dispatches to its downtown headquarters in Tehran, Iran's capital. As more details filtered in, the aid agency began mobilizing some 18,000 volunteers, many of them specially trained in disaster response, for immediate deployment to Bam. Tens of thousands more of the society's two million supporters began to collect donations—money, clothes, and blankets—to help the victims.

Less than 24 hours after the quake, the first field assessment came in: 20,000 people dead, another 50,000 injured, and tens of thousands of survivors homeless.

"It was a horrific scene," says Mostafa Mohaghegh, head of the Red Crescent's international office in Tehran. "There were bodies everywhere. The stench was unbelievable. Everything had been destroyed. Even the newer buildings that had not collapsed were badly damaged, the metal twisted and the concrete caved in."

Although scattered date palms penetrated the rubble virtually unscathed across the city, one of the only buildings left undamaged was the Red Crescent youth center in the middle of town. It was here that the Iranians established their field headquarters, which quickly became a nerve center packed with aid coordinators, computers, communications equipment, generators, and boxes of supplies.

Just as in Aceh, international aid agencies flocked to the scene. They began arriving in Bam the morning after the quake, including Swiss teams trained in disaster rescue. The Swiss came with their own equipment, emergency doctors, and search dogs. The controllers at Bam airport, with its terminal barely standing and all technical equipment knocked out, had to direct the high-volume air traffic visually, a risky procedure.

Survivors were found in the rubble by both foreign and local rescue workers, but for most it was too late by the time rescuers got to them. "After the first day or two there is no point," says Mohaghegh. "We found almost no one alive after that. But rescue groups from abroad kept arriving for days afterward. That was a waste of time and money."

Overall, an estimated 1,800 foreign aid workers from 44 countries came to Bam, most during the first month of the emergency phase. Their principal task was to assist the thousands of homeless. While the majority of the victims killed had been asleep in their homes when the quake hit, many of the survivors had gotten up early for morning prayers. Some were headed to the outskirts of the city to sturdy domed mosques, none of which sustained serious damage. Still, because people in Bam live in large extended families, a staggering number had lost scores of relatives—fathers, mothers, and children. Many threw themselves relentlessly into relief work, not only to help but also to try



GETTING UP AGAIN “God willing, the Citadel of Bam will be rebuilt,” says Enaietollah Afcharipoor, who still guards the 2,000-year-old fortress that crumbled during the quake. Zahra Dehghani (below, at right) has begun to rebuild her life with a 700-dollar loan from Relief International. She bought a cow, whose milk she sells to support her family and repay the loan.



BAM, IRAN

MAKING DO Old framework surrounds a shipping container that serves as a repair shop. Construction techniques are blamed for Bam's high death toll; a 6.6 earthquake in California days before killed only two people.

to forget. Almost all had also lost their homes and were now without shelter.

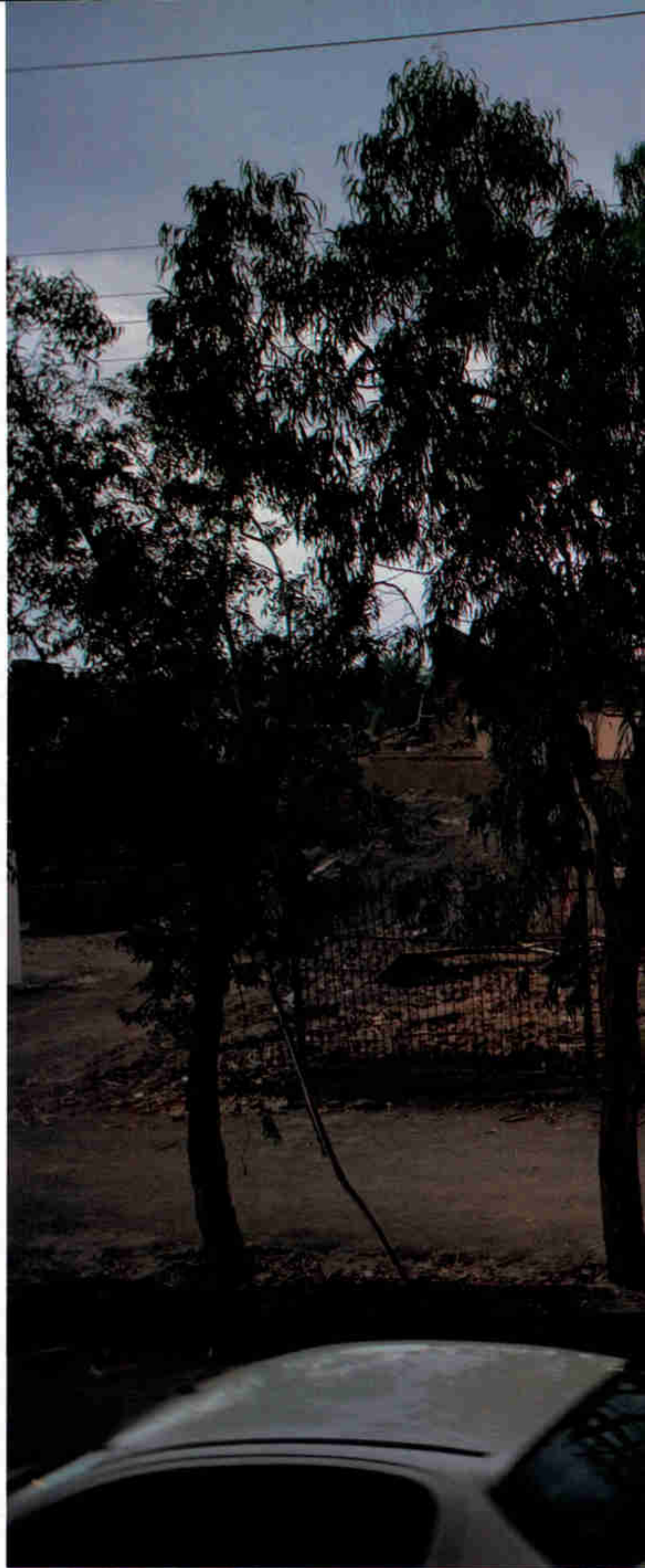
Governments and private individuals pledged generously, as they did a year later in the wake of the tsunami, to aid in emergency relief: 131 million dollars in all. But when photographer John Stanmeyer arrived late last May, Iranian officials said barely 17 million dollars had actually arrived. Furthermore, few international NGOs remained at work in Bam. A blanket of collapsed buildings and a few battered palm trees still defined the landscape. Many survivors had not returned to the sites of their former homes except to scavenge for belongings: a twisted bed frame, perhaps, or a dented pot. Dust coated everything.

A few months earlier, Doctors Without Borders had requested that tsunami donors begin sending unrestricted funds. The organization began tracking down tens of thousands of donors worldwide, offering to return to them a surplus of millions of dollars—or asking that they allow the money to be redirected. “Yes,” was the overwhelming reply. In the end, Doctors

New construction codes will address the geologic nature of Iran, seismically active like California and Japan.

Without Borders redirected 30 million dollars of tsunami money.

Little consolation for Bam. Still, with the help of such organizations as the World Bank and UNESCO, Bam has put together a master reconstruction plan. Much of the city will be rebuilt from scratch, designed by a team of prominent architects and consultants, with playgrounds and green recreational spaces—and earthquake-resistant buildings. Only the ancient mud citadel, an indispensable



cultural monument, is to be restored to its previous state.

Construction codes will be enforced—those that address the quake-prone geologic nature of Iran, seismically active like California and Japan, where large earthquakes take many fewer lives because of earthquake-resistant engineering. Even the adobe brick that collapsed so easily in Bam can be strengthened. Nader Khalili, an Iranian-American architect now at the CalEarth Institute in California, binds adobe with



barbed wire, a building method approved by California officials.

Although many of Bam's residents remain uprooted, normal life is slowly returning. Businesses and local bazaars with tented tea shops or makeshift food stands—wooden crates or tables laden with onions, powdered milk, or sugar—have popped up along the main thoroughfares. Toward the outskirts, people are living in prefabricated houses that have replaced the tents that served as temporary shelter.

Life is changing, too, in this conservative city. Women who lost their menfolk now rely on themselves to deal with bureaucracy and run a family business. While there is enormous pride among survivors—and emotional attachment to their city and its cultural heritage—many strive to rekindle businesses in order to reduce dependence on aid. “The earthquake may have destroyed the past,” says Mohagheh, “but it may also have created a new era here.”



AFGHANISTAN

AFTER THE WAR

Decades of fighting, with no end in sight
Risking death to save lives

Making prosthetic limbs for victims of war, technicians at the Red Cross center in Kabul have also been wounded, as have most of their 300 colleagues. Insurgents increasingly target aid workers, forcing humanitarian groups to worry about protecting their own people and thereby limiting their ability to help others.



Nitin Madhav is no stranger to the risks of humanitarian relief. On his first mission for Doctors of the World, in 1997, his team was attacked by Interahamwe, a rebel group,

a few days after he arrived in Kigali, Rwanda. Three colleagues were killed; Madhav survived by pretending to be dead, but his left leg had to be amputated.

Now, four years after coalition forces in Afghanistan toppled the Taliban for harboring Osama bin Laden, when Madhav works in the capital city of Kabul he is surrounded by concertina wire in the American Embassy compound. He and his colleagues with the U.S. Agency for International Development venture beyond city limits only with the embassy's security detail or a military escort.

Humanitarian space, where aid workers can operate neutrally without interference in conflict zones like Afghanistan, has become harder to define. In lawless frontline zones, aid workers themselves have become targets, victims of a Kalashnikov culture where gun-toting civilians target aid workers for a variety of self-serving purposes.

While much of the violence has been concentrated in a clutch of countries—Afghanistan, Iraq, Sudan—and in central Africa, humanitarian workers are deliberately, and increasingly, targeted elsewhere. From July 2003 to July 2004, more than a hundred UN and NGO personnel were killed. “This makes the work of agencies more precarious,” wrote Denis Caillaux of CARE International. “But worse than that, every time workers are targeted or cannot operate for fear of attack, it’s the civilians who pay the price.” Indeed, Doctors Without Borders closed down operations in Afghanistan after five of its workers were assassinated in 2004. The organization protested that the Kabul government made no attempts to arrest the suspected perpetrators.

“The trouble is that even with relief workers getting kidnapped and killed, you soon find yourself regarding everything as normal,” says Leslie Wilson, a former American Peace Corps volunteer now with Save the Children in Kabul.

“It’s all relative, and that’s dangerous. Tolerance levels go up. Just look at the horrors that occur in conflict zones like Darfur, where the military thinks it’s OK to kill aid workers and civilians.”

As in many conflict situations, aid workers withstand the risks they face by indulging in the pleasures of their former lives. “You’ve got to be careful, but you’ve also got to live,” said Amaury Coste, a 32-year-old Frenchman who invited me to a dinner party. Coste and I had traveled to eastern Afghanistan’s Nuristan and Konar Provinces two years earlier. Today, both are no-go areas for aid workers and journalists (last June rebels shot down a Chinook helicopter in Konar, killing all 16 U.S. soldiers on board).

The evening of Coste’s dinner party the mood was relaxed in his modest rental house in one of Kabul’s war-shattered western districts. The host lounged against pillows on a ruby red carpet, smiling in anticipation of the *kabuli* (rice with mutton) that his Afghan cook had prepared, and the flavorful red wine that would complement the traditional dish. As usual, the conversation turned to security issues. For the past three years Coste and some of his friends had taken part in the internationally supported recovery operation by producing such innovative media projects as traveling theater to raise environmental awareness and comic books for children on constitutional reform.

After dinner Coste walked me out into the cold spring night. “By the way, we’re going skiing up by the Salang this weekend. Why not join us?” he suggested, referring to the mighty, snow-clad Hindu Kush range just north of Kabul.

I felt a rush of adrenaline as I imagined skiing those slopes. But then I hesitated.

“What about land mines?” I asked, slightly embarrassed.

“It’s best not to think of them,” Coste answered with a shrug. “One’s got to be philosophical about these things.”



PROTECTIVE COVER At the International Security Assistance Force headquarters in Kabul (above), soldiers increase security by surrounding their barracks with blast-proof shields. Aid workers gather to relax in a restaurant in Kabul. "Anything could happen here," says violinist-engineer Edward Hanna (below). "I'm living with the faith that God controls everything."



NORTHERN UGANDA

THE FORGOTTEN CRISIS

19 years of armed insurgency

Massacres, child abuse . . . and global apathy

Driven by fear, women and children walk miles every evening to seek shelter from night raids by the Lord's Resistance Army (LRA). Since the 1980s, the rebel group has fought to overthrow the Ugandan government while raping, beating, and killing civilians. Death toll: an estimated 100,000 people.







NIGHT RUNNERS Exhausted but safe, some 3,000 children sleep nightly at Noah's Ark Centre in Gulu, one of several shelters offering protection from raids by the LRA. The rebels have abducted 20,000 boys and girls who are forced to serve as soldiers or sex slaves, creating an army made up almost entirely of children.

Milen Kidane, a 33-year-old Eritrean protection officer with UNICEF, held my arm firmly as we entered the Rachele Centre, a large walled compound with half a

dozen dormitories in Lira, a bustling market town in northern Uganda. Kidane, an effusive woman with a warm smile, helps care for some of the score of children who come to the center every month, all former abductees of the Lord's Resistance Army (LRA), rebels in northern Uganda fighting to overthrow the Ugandan government in the name of strict Christian rule. For the past 19 years, LRA guerrillas have sneaked into villages at night, killed or mutilated people at random, and kidnapped children to serve as slaves and fighters. Some of the children are forced to kill their friends or families.

Humanitarian workers like Kidane, working behind the scenes in conflicts mostly ignored by the rest of the world, represent, quite simply, hope in hell. Kidane has provided that hope for wounded and traumatized children escaped from or released by rebels. Some 2,400 of them have passed through the Rachele Centre since it was opened in 2003 by Belgian journalist Els de Temmerman.

Funded by both the government and individual sponsors in Belgium, the center provides psychological support and medical treatment to the young victims, preparing them to return to their families in IDP (internally displaced persons) camps or villages to pick up the pieces of their lives. Those whose parents are dead go, also with funding from Belgian sponsors and local NGOs, to boarding schools or vocational training centers.

In a whitewashed schoolroom, Kidane and I nodded a polite greeting to small clusters of children who sat at wooden tables drawing pictures. Some showed memories of former lives—houses and families. Others showed matchstick figures with dreadlocks hacking at men, women, and children with machetes, shooting them with guns, or attacking government soldiers. The drawings of helicopters, armored vehicles, and trucks were astonishingly realistic.

“Most of these children have spent four or five years in captivity and have witnessed all sorts of atrocities,” said Kidane. “But they have survived. The majority stay here for five or six weeks before returning to their families.”

Kidane explains how the Ugandan government helps the rehabilitated children broadcast on local radio stations to the bush rebels, appealing to their former commanders to surrender as part of a government amnesty program. “They also hope to let friends who are still captives know that they’re alive.”

As I explored the compound, I came across Dick O. (last names are not revealed here), a 12-year-old boy with a cast on his leg from a gunshot injury. He had a dozen or so bayonet wounds, almost healed, in his chest. Dick told me a tale typical of the thousands of young Ugandans robbed of childhood by the LRA.

He remembered the night he was kidnapped by the rebels. “I could hear them come into the village. There was a lot of shouting. They came to our hut and pointed guns at us. We were very scared.” The men forced him and six other boys, including his brother, to loot the trading post. “We put everything on our backs. They beat us and pushed us into the bush. Then we had to walk.”

Once in the bush, the boys were distributed as personal slaves or soldiers to the commanders. As for the captured girls, they were offered to individual rebels as soldiers, sex slaves, or wives. Those who would not obey, or who cried, were beaten; some were killed.

Dick received basic military training and was often forced to watch civilians being tortured and murdered. Sometimes he and the other boys had to stab or bludgeon people to death; otherwise they, too, would be killed. “Then we had to drink their blood,” he said, fidgeting with his fingers. “They made us drink so that we became part of the dead people. This way we all killed.”



BROKEN LIVES Alex O., 13, who lost his leg and his innocence when the LRA kidnapped him in 2003, found refuge at the Rachele Centre (below), which helps child captives recover. "I was constantly scared of being killed," he says of his past life. A million and a half other uprooted Ugandans live in crowded tent cities such as Pabbo camp (above).



NORTHERN UGANDA

SMALL VICTORY Action Against Hunger's Juliet Awor (in blue head scarf) celebrates a success with women from the Apala camp: They now have more latrines than any other shelter in the area. Such breakthroughs in sanitation can be a huge help in keeping crisis victims alive. But there's more at stake, says Awor. "These people struggle for the dignity of fending for themselves."

Finally Dick managed to escape. Nearly dead, he was found by a Ugandan soldier who had him brought to a hospital. Eventually he was taken to the Rachele Centre to recuperate.

Dick's face, passive through all this, became animated as he spoke of his future plans. "I want to go back to school as soon as my leg is better." I asked him what he hoped to do with his education. "I want to become a doctor so that I can help other people," he said with a faint smile. "There are many people in Uganda who need help."

Grown beyond youth in so many ways, the children at the Rachele Centre are learning to play again. I found Kidane with a crowd of them in the midst of a volleyball match on a dusty court. Although some were still recovering from severe injuries, all were laughing and cheering. Panting with exertion, Kidane stepped out of

Sometimes Dick and the other boys had to stab or bludgeon people to death; otherwise they, too, would be killed.

the game and listened calmly to my horrified repetition of the atrocities Dick had both endured and committed in his short life.

"Sometimes it's hard to remember that these are children," she said softly. "It's not the fault of a child for carrying a gun at nine years old or for committing atrocities. We all have to take responsibility for what is happening to them."

Most of the aid workers I've encountered in 25 years of reporting wars and humanitarian crises are just like Kidane: ordinary individuals undertaking extraordinary jobs to help people



caught in disaster. Kidane took up her assignment in Uganda after working in Afghanistan, Congo, and Iraq, experiences that led her to conclude that international relief efforts are sometimes more about short-term political gain than about long-term humanitarian relief. Well publicized Band-Aid assistance is easier than tackling the deeply rooted social, economic, and cultural problems—like those in northern Uganda—that spark conflict and lead to catastrophe.

Unlike the strife in Afghanistan and Iraq, the



war in northern Uganda, like most of the long-term catastrophes in Africa, rarely merits more than minimal attention from the world and the media. And so for many Ugandans the trauma continues. Fear of the LRA drives some 30,000 children to trek each night into town centers to sleep in classrooms, churches, or relief centers before returning home or to their schools at first light.

After two decades facing down relentless kidnapping, murder, and mayhem, relief workers in Lira told me they often wonder if they're

making any difference at all. I shared that thought with Kidane.

"You know," she said, "sometimes all you can do is help to change one life at a time." I thought of Dick and his dream of medical school. She was right. □

IS THERE EVER ENOUGH? Experience the Sights & Sounds of frontline aid workers as they deliver relief to victims of crisis and disaster, especially after the media move on and the world looks away. Explore the many challenges of global aid with photographer John Stanmeyer at ngm.com/0512.

A photograph of a polar bear and her cubs in a snowy den. The bear is on the right, huddled with her cubs. The scene is set in a snowy, blue-tinted environment.

Winter in a
Canadian
National Park

refuge
in
white

A polar bear shelters her three-month-old cubs as they travel from their den to Hudson Bay.



BY JOHN L. ELIOT

NATIONAL GEOGRAPHIC SENIOR WRITER

PHOTOGRAPHS

BY NORBERT ROSING

The bears start to move in October, when longer nights chill Hudson Bay and snow starts to fly. Along the stony western shore, they head north over the salt marsh toward Cape Churchill. Hunting season is about to begin, after a four-month fast since the annual ice breakup in July. Almost all summer the bears have been in “walking hibernation,” sleeping in dens and occasionally wandering through a vast boggy lowland called Wapusk National Park, living mainly off their fat reserves.

But soon shoreline ice will form. By walking north, the bears know they will find it and their staple prey—ringed seals—faster. In November when the ice usually thickens enough to walk on, hundreds of male bears and nonpregnant females roam far from shore, scanning and sniffing breathing holes of unwary seals. About 200 pregnant females remain behind, for Wapusk offers them excellent nurseries.

“More than half of Wapusk is peat bog, and some of the peat is 12 feet thick,” says Cam Elliott, superintendent of Wapusk. “It’s perfect for polar bear maternity dens. Females have dug more than 1,200 in the area, one of the largest concentrations in the world.”

Land and ice are bound together for the polar bears of Wapusk, “white bear” in the Cree language. But the 4,431-square-mile park (nearly the size of Yellowstone and Yosemite combined) also holds plenty of other species. “It is the ecotone, the transition zone, between the boreal forest and the open tundra,” says Andrew Derocher, a University of Alberta biologist who studies polar bears. “There are few places where polar bears, black bears, the occasional grizzly bear, moose, caribou, red fox, arctic fox, beluga whales offshore, and others overlap. The biological diversity of the area is huge.” Almost 200 bird species breed here, or migrate through, including boreal owls, hawk owls, snowy owls, gyrfalcons, and peregrine falcons—a bonanza for bird lovers.



Land and ice are bound together for the polar bears of Wapusk, “white bear” in the Cree language.



It's November, and a female leads her two cubs to hunt seals on frozen Hudson Bay. She gave birth to them two years ago in Wapusk National Park, visible on the horizon. A warming climate is shrinking the bay's ice—and without it polar bears cannot hunt.





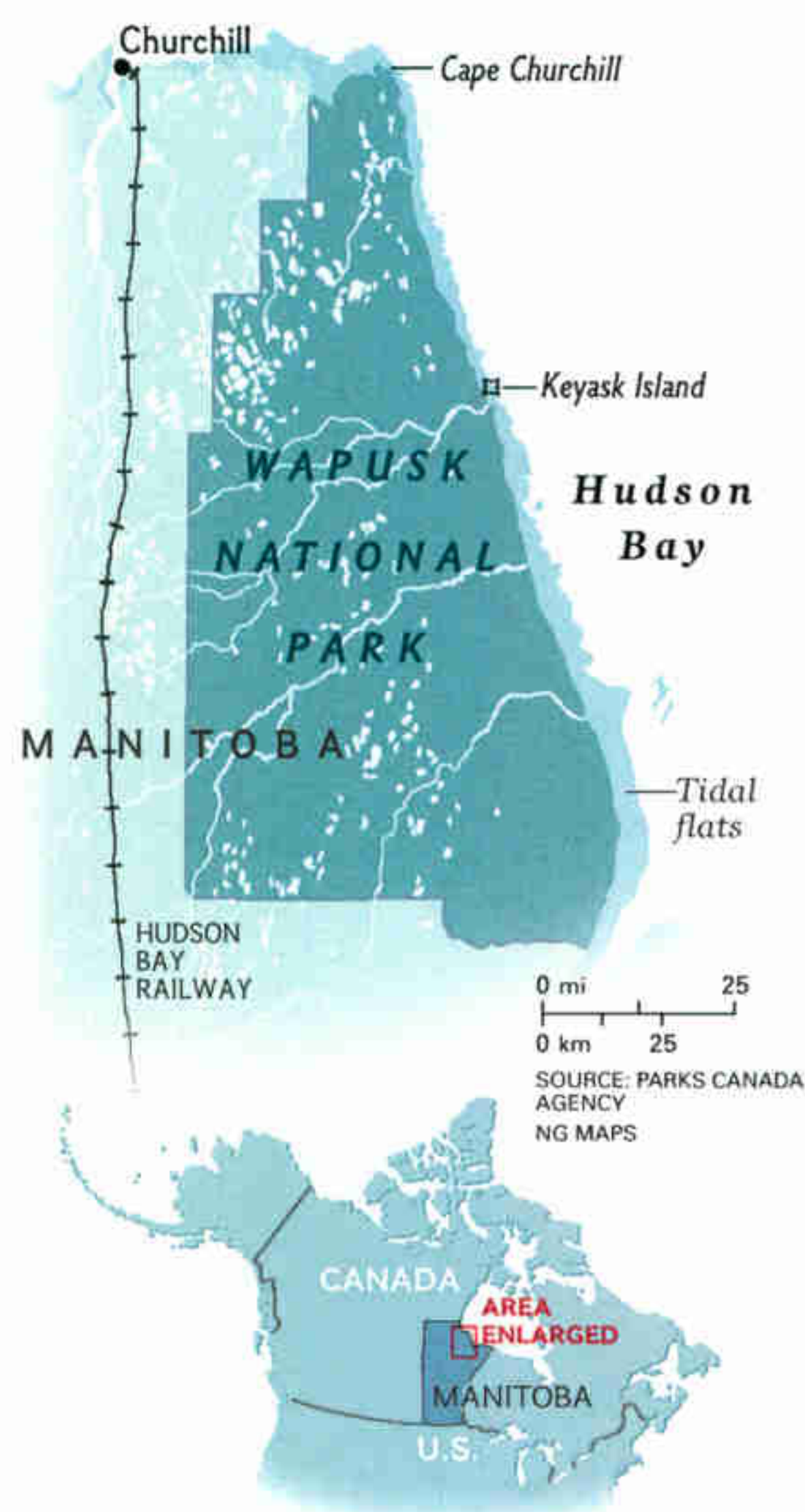
Early snow mantles lakes and ponds in late October, with Hudson Bay beyond. Wapusk mostly looks like this—lakes and wetlands made up of fens and nearly impassable peat bogs, or muskegs. A polar bear can traverse the swampy lowlands, but few humans try.

Yet visitors to the area, more than 15,000 a year, stay west of Wapusk, in or near the town of Churchill. Fewer than a hundred visitors a year have come to Wapusk since it was created in 1996, partly for the protection of the bears and their denning habitat. “The two areas are right next to each other, yet they’re so different they might be two separate countries,” says Elliott.

Simply put: The Churchill area, which lies along a bend of the coast running west from Cape Churchill, is underlain by bedrock near the surface, which makes it much firmer than Wapusk to the south (where the bedrock is deeper). So the Churchill area is terra firma, easier to walk on, drive on, even build a town on (they did). Since the retreat of the last continental glacier some 8,000 years ago, the land has been springing upward. This is some of the youngest land in Canada—and some of the soggiest. There are thousands of lakes and ponds in Wapusk. Bog, bog, bog. There is peat bog, or muskeg, dangerous if you take a misstep and fall into a muskeg hole. All of this is seasoned with an enormous and aggressive population of biting invertebrates.

In Wapusk there are no roads, no trails, no motels, indeed no tourist facilities of any kind. The terrain is too daunting, the bears too dangerous, and the liability too high for Parks Canada, Wapusk’s overseer, in case of attack. A few people pay a thousand dollars (U.S.) an hour for a short helicopter flight in summer to view an unoccupied den, or visit a small temporary camp in the fall to watch the bears, or ride snowmobiles in late winter hoping to glimpse newborn cubs.

But these bears are in trouble. Hudson Bay polar bears, some of the southernmost in the world, are feeling the heat of global warming. The region is about two degrees (F) warmer in winter than 50 years ago. The bay’s ice is breaking up in early July rather than late July, says Nick Lunn of

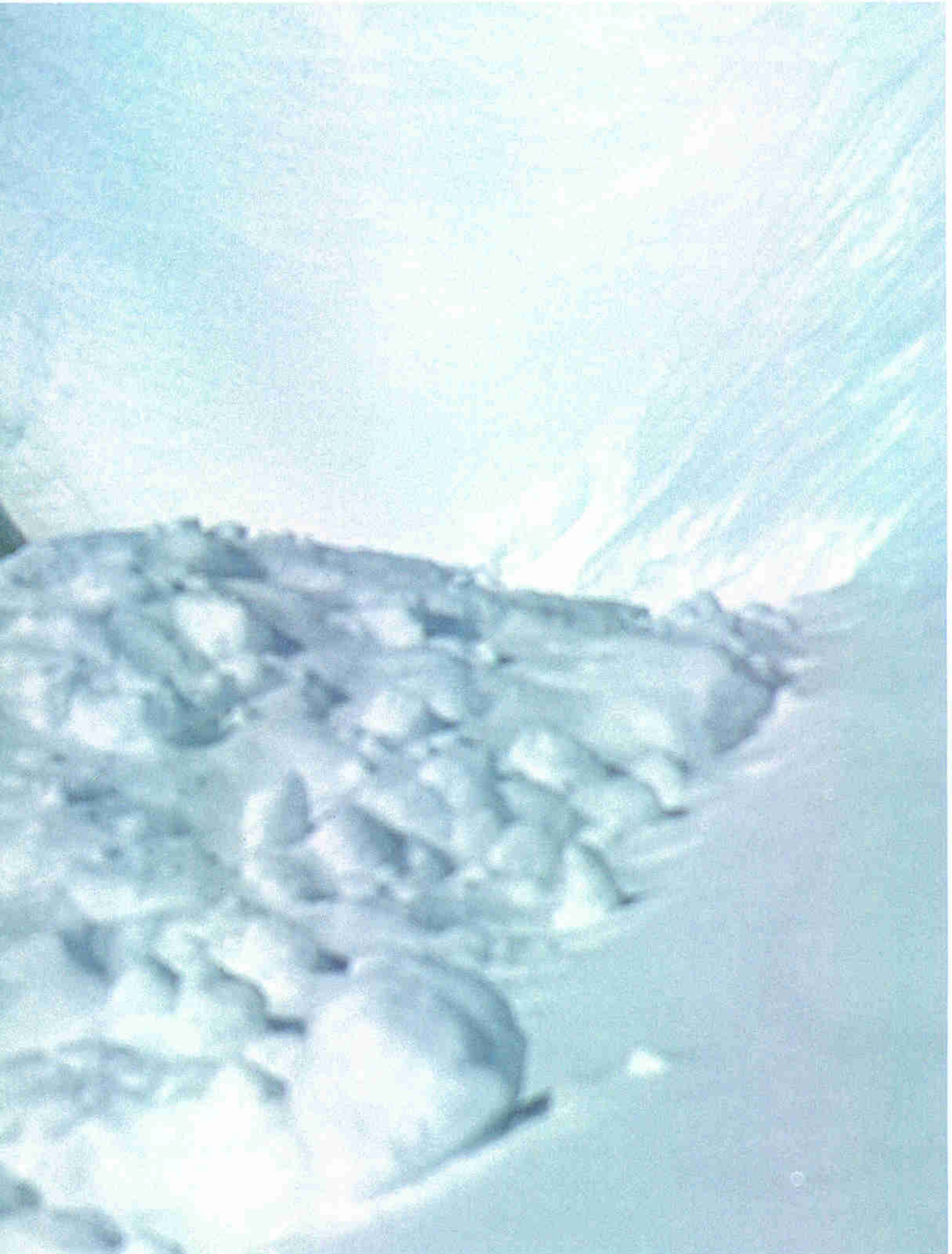


Part of Canada’s Hudson Bay—James Bay lowlands, Wapusk’s 2.8 million acres encompass coastal marsh, spruce forest, tidal flats, and peatlands. Landforms turn fanciful on the bay in November when snow sculpts Keyask Island and its sandbars. In June melting ice gives an arctic tern a high perch to attract a mate.

Few people visit Wapusk—the terrain is too daunting,
the polar bears too dangerous.







Amid wind-whipped snow in March, a female and her cub peer from a temporary shelter she dug in just half an hour. About a week earlier they left the maternity den and headed for Hudson Bay—still 20 miles from this spot—where the female will hunt seals and end a long fast.

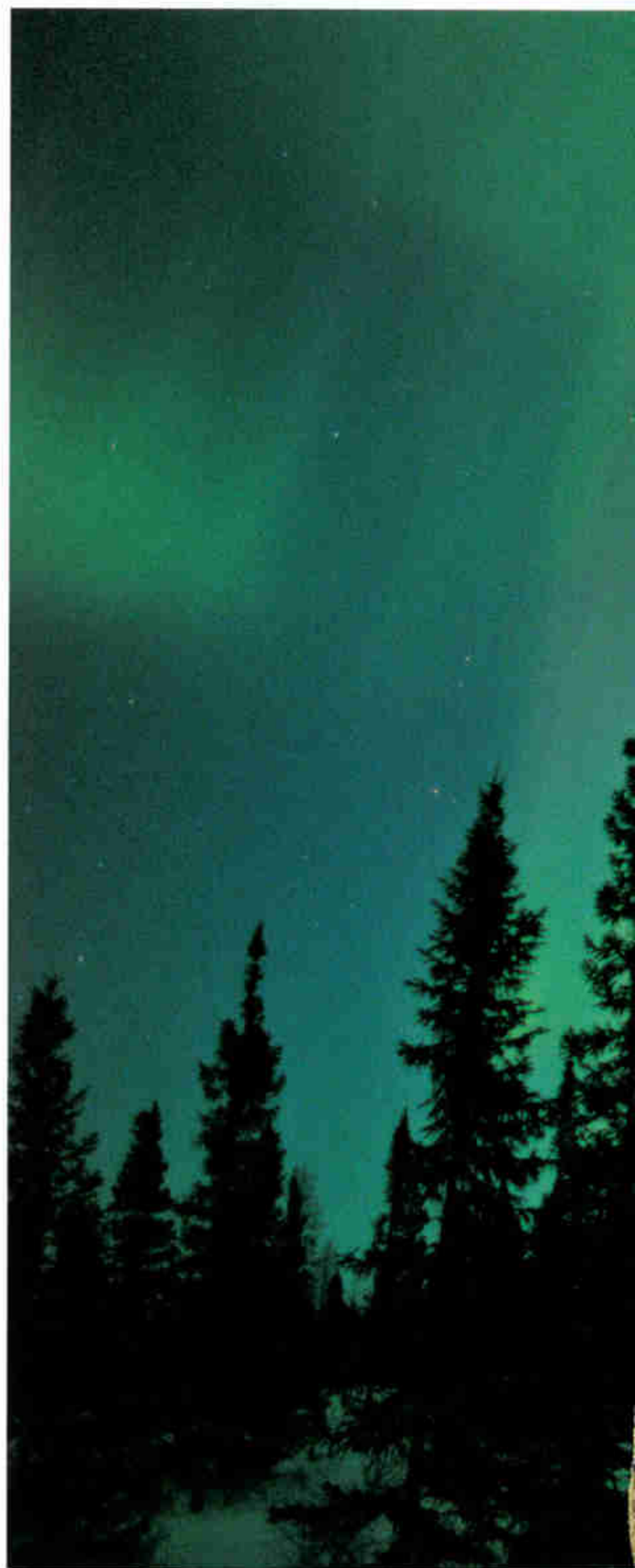
the Canadian Wildlife Service. The earlier the ice disappears, the less time bears have to feed on seals. Pregnant females need to gain at least 200 pounds to sustain them through the long fast in their dens, where they may spend eight months. In the past they've been able to kill many seal pups being weaned by their mothers in early July. Now, with the ice melting sooner, the bears can't hunt and must forsake that nutrition. Such deprivation leads to fewer cubs surviving to adulthood.

"For every week that the ice is breaking up earlier, the bears are coming ashore more than 20 pounds lighter," says Lunn. He and his colleagues—including Derocher and Ian Stirling of the Canadian Wildlife Service—estimate that the bears are 15 percent smaller than they were 20 years ago. And Lunn says the latest census shows that in just ten years the bears' population has declined from 1,200 to less than 1,000. It doesn't seem like a temporary drop. "Until recently the numbers have been stable. The last two censuses, in the mid-1980s and mid-1990s, both showed 1,200 bears," says Lunn.

By 2050, southern Hudson Bay may be ice free year-round. Will Wapusk's bears move north?

"There are already 2,000 polar bears in northern Hudson Bay," Lunn says. "The area probably can't take any more. The environmental changes in Hudson Bay are happening so fast that one day the bay may no longer be able to support polar bears."

Wapusk's bears will have to stay ashore longer and longer, marooned in the park created for them, watching and waiting for the ice. To the north the rest of the world's polar bears, about 25,000 of them, roam the Arctic. As the climate warms, what about them? □



WINTER WHITE Decorate your desktop with polar bear photographs. Then see the bears in action via video, browse Web-exclusive images, and read tips from the photographer at ngm.com/0512.

Environmental changes are happening so fast that one day the bay may not support the bears.



Celestial curtain of the aurora borealis drapes Hudson Bay some 300 nights a year, most visible from late fall until early spring. Few humans see it when it falls on Wapusk—a place not for people but for the great white bear.





A mouth bristling with fangs made *Nothosaurus giganteus* an efficient killer. This 13-foot hunter, one of the most ancient marine reptiles, plied waters that covered much of Eurasia about 230 million years ago.

ART BY DAMNEX

WHEN MONSTERS RULED THE DEEP

More fearsome than anything Hollywood could ever dream up, huge reptiles prowled ancient seas—and still prey on our imagination.





Kronosaurus, a 33-foot, 11-ton carnivore, chomps down on *Woolungasaurus*. Paleontologist Colin McHenry thinks large pliosaurs like *Kronosaurus* were among the most powerful predators of all time: "There were no others with a seven-foot skull armed with teeth the size of bananas." Both reptiles swam seas that covered Australia between 110 and 98 million years ago.

ART BY MATTE FX AND NGM ART

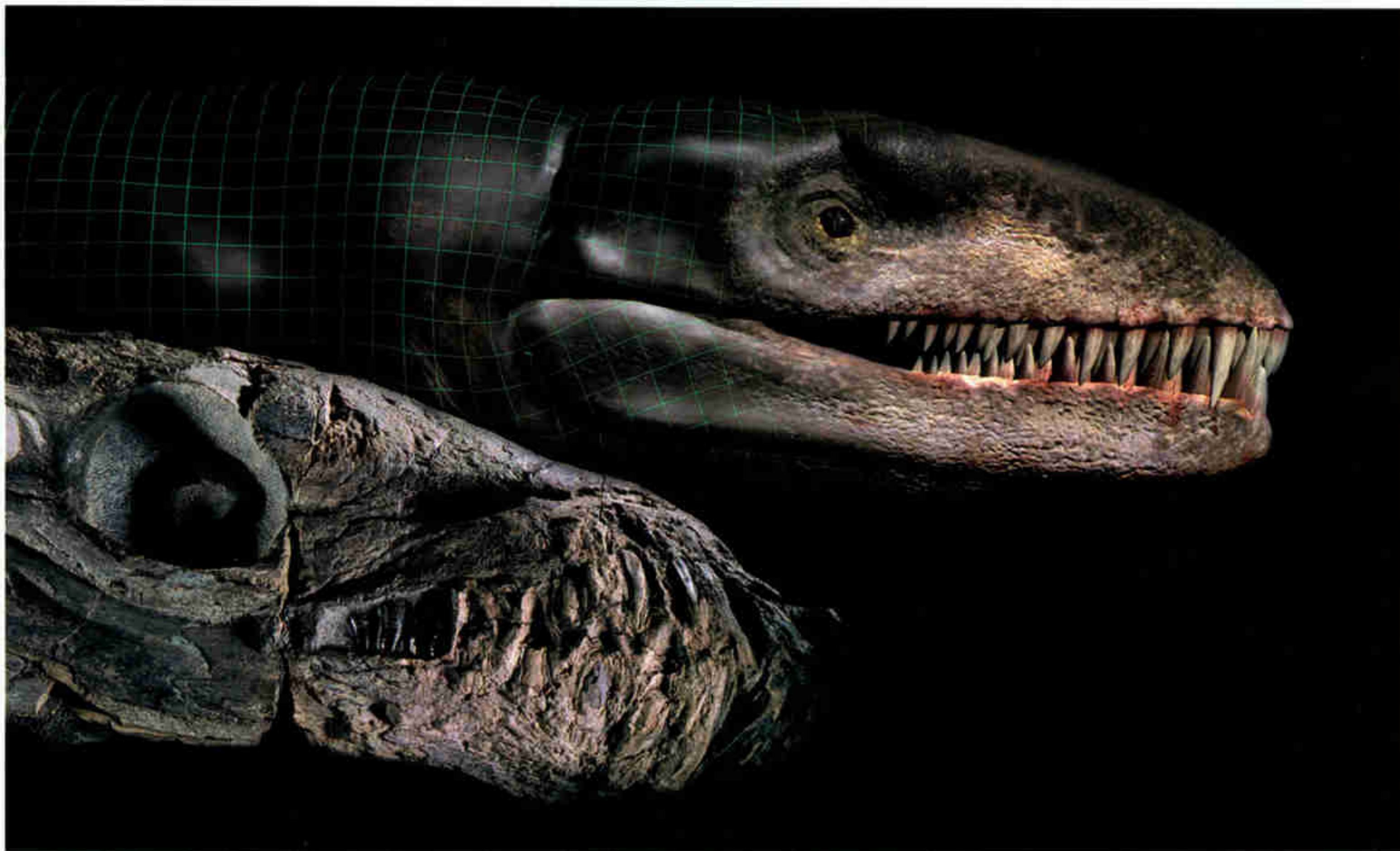
BY VIRGINIA MORELL

There is nothing quite so frightening as the idea of a sea monster. Unlike *T. rex* and other giant dinosaurs, which went extinct, might sea monsters live on? Might they lurk beneath the leaden cloak of the oceans, breaching occasionally into view? Through the ages, serious mariners have returned to port with accounts of huge, snaky beasts baring teeth and trailing feathery manes, undulating through the waves or rearing like a horse. Stories about water serpents have slithered into many cultures. Three legends—from Scotland, North America, and China—are plumbed in these pages. But what about the science of sea monsters? In fact, there was a time when they did exist. About 250 million years ago Earth's continents were gathered into one landmass, Pangaea. Shallow seas and the lack of significant marine predators created new niches for many reptiles that had developed on land. They wriggled into the water, swam, reproduced, and died, becoming the fossils on which the computer-generated art in this article is based. They remain, with good reason, the stuff of nightmares.



EARTH'S OCEANS ABOUT 250 MILLION YEARS AGO





Making Monsters

Science tells us a lot about prehistoric reptiles, and art fills in the rest. Sculptor Gary Staab started with a fossil of the predator nicknamed “Godzilla” (above) and asked, “How do I breathe air into the lungs of that thing?” He applied clay to a wire frame, made a silicone mold, and from that a resin model, which was then digitized. Computer artists led by Mark Dubeau added the smooth skin of a whale, the color of a crocodile, and scars as seen on sharks and other big predators. A giant ichthyosaur (below), modeled by sculptor Donna Sloan and digitally colored, would take 18 wheels to transport. “The intriguing thing about ichthyosaurs,” she says, “is how they were sculpted so perfectly by their environment.”

▶ **MANIPULATE 3-D MODELS** of these creatures and download them as wallpaper at ngm.com/0512.



NESSIE

WORLD-FAMOUS SEA MONSTER

“You’ll never see Nessie in this weather,” my cab-driver says, shaking his head as we drive along the narrow road bordering Scotland’s Loch Ness. “It’s much too hot for him. He’ll stay down deep in the loch, where it’s cool.”

Maybe so, but I stare long and hard at the loch’s placid waters anyway. It’s on days like this, others insist, that the loch’s surface stillness is shattered, and a creature (him or her)—a large beast with a back shaped like an inverted boat—surfaces briefly, then dives to the depths again: Nessie, the world’s most famous sea monster. So far, more than a thousand eyewitnesses claim to have seen the Loch Ness monster—or at least the waves it leaves behind when diving into its dark-water lair. But Nessie is only one of many water monsters. From the misty coasts of Scandinavia to the thick forests of the Congo to the plains of North America, nearly every culture seems to have its Nessie. And in many instances, the legendary monsters are linked to actual fossils of marine reptiles that ruled the seas from about 250 million to 65 million years ago.

The few times Nessie has supposedly been caught on film or by sonar soundings, it most closely resembles a plesiosaur, a long-necked, seagoing reptile that went extinct along with the terrestrial dinosaurs about 65 million years ago. That a plesiosaur would be alive today, plying the fresh waters of once glaciated Loch Ness, defies scientific reasoning.

“Some years ago I was on a boat one night. We were tied up, at the end of a mirror-calm day. And then the boat was rocked by three big waves. I was sure it must be Nessie swimming past,” says Steve Feltham, a self-appointed one-man Nessie-watcher in his 40s. You might expect such a person to be a bit wild-eyed, but Feltham is anything but kooky. He’d been hooked on the Nessie legend as a kid and moved here in 1991 to dedicate himself to his project: “Nessie-Sery Independent Research.”

But the only apparent evidence of research is a pair of mounted binoculars, which he happily lets visitors peer through while answering their questions. Because most boil down to one—“Have you seen it yet?”—Feltham plans to rename his project: haveyouseenityet.com.

“If the site keeps half of them from asking me that bloody question . . .,” he says, his voice trailing off.

Of his near Nessie encounter, Feltham says: “It wasn’t Nessie. I’ve since learned that it’s the aftermath of storms and the shape of the loch that cause those kinds of waves.” He pauses. “But I still think there’s something out there that’s unexplained. I’ve seen other things and heard about things that I haven’t figured out yet. That’s why I stay.”

Just then a young man and woman saunter up to Feltham’s umbrella-shaded table. “Can we ask you a question?” the man says.

“Yes, of course,” Feltham replies.

The couple eye him intently; they look worriedly hopeful, like children about to ask their elders if Santa Claus exists. “Have you seen it yet?”

“No,” Feltham answers politely, as if this is the first time the question has been posed. “Not yet.”

Feltham believes that a large fish—perhaps a catfish—is most likely the cause of many sightings (although he doesn’t tell this to the couple). “I don’t think they’re monsters,” he says. “Whatever they are, they’re very timid animals; they’re more afraid of us than we are of them.”

That wasn’t always the case. The first written account of the monster was in a seventh-century book on the life of the Irish saint Columba. One of his companions was swimming across the River Ness at the head of the loch when an “aquatic monster” surfaced and, “giving an awful roar,” attacked “with its mouth wide open.” The others were “stupefied with terror,” but St. Columba coolly made the sign of the cross and



A famous “photo” of Nessie taken in April 1934 was revealed as a fraud 60 years later by 90-year-old Christian Spurling, who said he joined a fake neck and head to a toy submarine.

► **SHARE YOUR THOUGHTS** on Nessie in our forum at ngm.com/0512.

commanded the beast to stop. It fled at once.

In those days people most likely imagined the Loch Ness monster as a sea serpent or a water kelpie, a diabolical beast with a horse’s head—creatures said to lurk in the lakes and coastal waters of Scandinavia and Scotland. Nessie only morphed into a plesiosaur many years after the first fossil of a strange marine reptile was discovered in 1719 in a quarry in Nottinghamshire, England.

By the early 1800s fossil hunters had unearthed more plesiosaur skeletons as well as those of other ancient marine reptiles, including big-eyed, dolphin-shaped ichthyosaurs and the shorter necked pliosaurs with their massive jaws and huge, crushing teeth. Dinosaurs had yet to be scientifically recognized, and the huge sea monsters of the past—none of them dinosaurs—gripped the public’s imagination, especially after artists began painting scenes of ichthyosaurs, plesiosaurs, and giant crocodiles writhing in combat. “Those paintings

put a plesiosaur-like animal into the public mind,” says Olivier Rieppel, a paleontologist at the Field Museum in Chicago, noting that nothing shaped like a plesiosaur swims in the oceans today.

Nessie got a boost in 1933 with the film *King Kong*, set in a land where dinosaurs roam and a long-necked creature surfaces from a lake not unlike Loch Ness. That same year a “prehistoric” animal was spied crossing a road near the loch. The next year the London *Daily Mail* published a photograph depicting a creature whose small, snaky head rides above the loch on a long neck: Nessie was now a certified plesiosaur.

That photograph and others have been proved to be hoaxes. But who cares? Every summer Loch Ness is packed with tourists. They come in busloads to Feltham’s trailer, and one by one they ask him, “Have you seen it yet?”

“They want me to say I’ve seen a plesiosaur,” says Feltham. “And they all hope to see it for themselves. It’s just not likely to happen.” •

“We were tied up, at the end of a mirror-calm day. And then the boat was rocked by three big waves. I was sure it must be Nessie.”



Opportunist

A leviathan nicknamed "Godzilla," scavenging an ichthyosaur, warns pterosaurs that this meal is taken.

Distantly related to modern crocodiles, Godzilla had paddles instead of feet, a rudder-like tail, and a head that resembled a carnivorous dinosaur's. "This sea croc reminded me of the famous Godzilla coming out of the sea," says Argentine paleontologist Zulma Gasparini, who, with colleagues Sergio and Rafael Cocca, found fossils of this monster in the past decade. She adds that Godzilla did more than scavenge. "It ambushed large prey. It was a top predator."

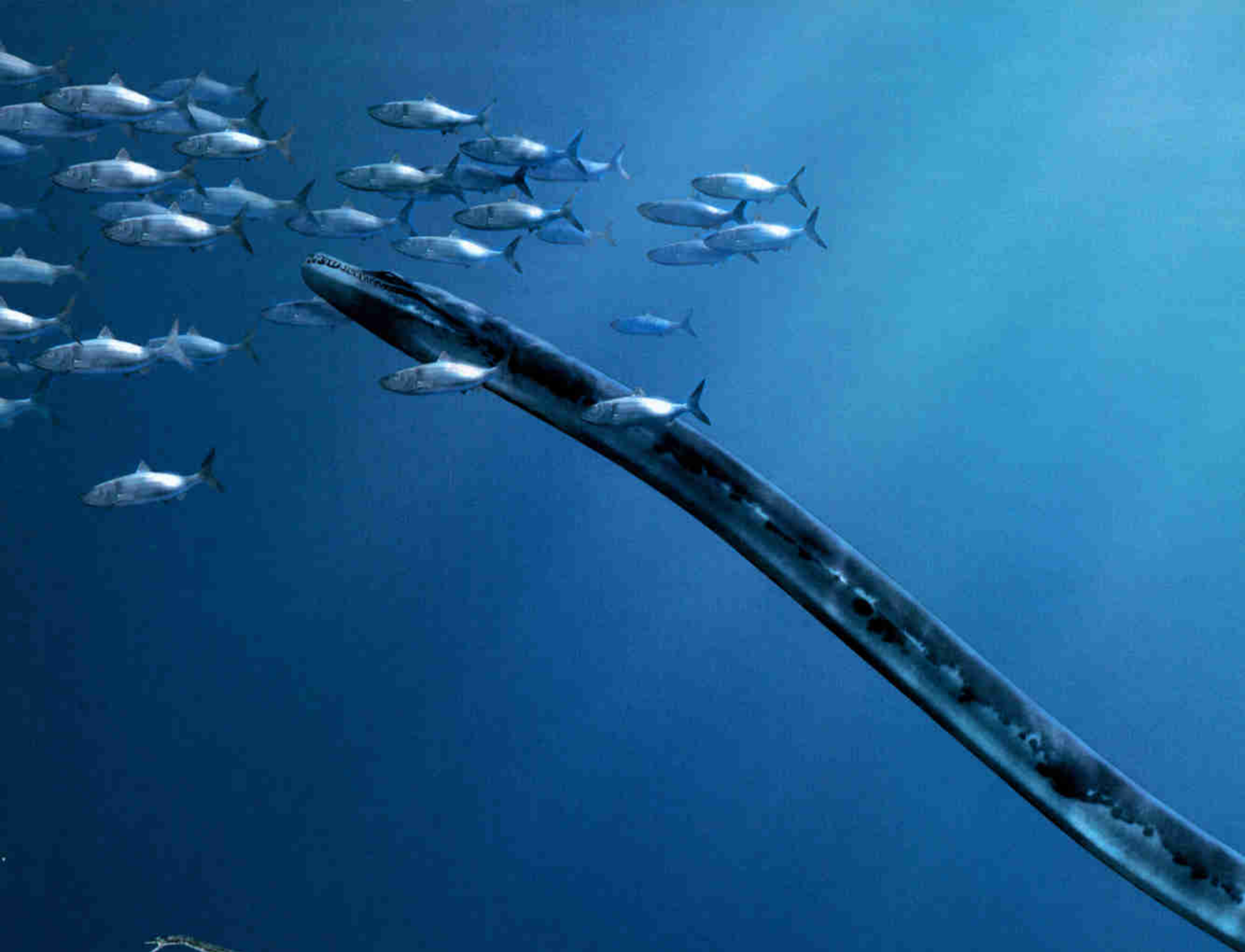
MONSTER FACTS

WHAT "GODZILLA," ANCIENT RELATIVE OF MODERN CROCS

WHEN 135 MILLION YEARS AGO

WHERE SOUTH AMERICA





The Stalker

Slinking up to a school of *Apsopelix*, *Thalassomedon* uses its 20-foot neck—half its body length—to hide its bulk in the dim waters behind. This is the classic Loch Ness monster form. Within a group called plesiosaurs, *Thalassomedon* was built for stealth rather than speed. It carried stones in its stomach for ballast and to aid with digestion. Four flippers, each the size of a human, let *Thalassomedon* glide through the ocean. It hunted in waters that covered Colorado, where it sets up the kill . . .







The Slasher

... and then finishes it. *Thalassomedon's* head jerks to the side, stabbing its quarry. These lateral lunges solved a problem: When jaws slam shut they can expel water, and with it fish, but not if the head is moving sideways. Crocodiles use the technique today. Razor-sharp interlocking teeth ensured the catch. "This animal was nasty," says paleontologist F. Robin O'Keefe. "You don't have teeth like that and eat grass."

MONSTER FACTS

WHAT *THALASSOMEDON HANINGTONI*

WHEN 95 TO 93 MILLION YEARS AGO

WHERE NORTH AMERICA

► **WATCH** this *Thalassomedon* come alive at ngm.com/0512.

ART BY MATTE FX AND NGM ART

UNKTEHILA

MONSTERS IN NATIVE AMERICA

In a small auditorium at Mount Rushmore National Memorial in the Black Hills of South Dakota, Kevin Locke, a Lakota Sioux storyteller from Standing Rock Reservation, gently strokes a braided strand of sweetgrass. Its power will help him bring forth good thoughts and feelings. Then he grips his ceremonial rattle, closes his eyes, and, as an attentive audience of Lakota Sioux children and visiting Boy Scouts listens, he sings a Lakota prayer used at the springtime Thunder Feast.

"Leciya tuwa makipanpelo. Wiyohpeyata Wakinyan Oyate kola makipanpelo."

The words rise and fall to the sound of Locke's rattle, and he gives it an extra flourish at the end, signaling the close.

"We sing this to welcome the Thunder Nation," Locke explains, referring to thunderstorms. "Maybe some of you have heard the word *Wakinyan* before and know its meaning?"

One slender Lakota boy raises his hand. "It's the name of our cat—he's orange like a Thunder Being."

Locke smiles broadly. "Good, good. That's right, *Wakinyan* are the Thunder Beings, forces with power, like the Thunder Birds. They come with the big cumulus clouds in the spring to the prairies. The *Wakinyan* bring the rain, hail, thunder, and lightning—all the things that renew life after the winter. But in the long ago days, before humans, the *Wakinyan* also used these things in a big battle. And that battle was with the evil water monsters, the *Unktehila*."

There were many different kinds of *Unktehila*, Locke continues, but most were like huge reptiles with scaly skin and horns; some were like giant lizards, and others were like serpents; some

slithered on their bellies, and some had feet. "They ate each other and every other living thing, and so the Thunder Beings were given a divine mission to kill the *Unktehila*. That's when the Thunder Birds came with their thunder and lightning. They struck the water monsters with lightning bolts and boiled their lakes and streams until they dried up. After that most of the *Unktehila* died or were very diminished in size, so that all we have left today are some small snakes and lizards. But we know the giant *Unktehila* lived because our people found their bones in the Badlands and along the Missouri River."

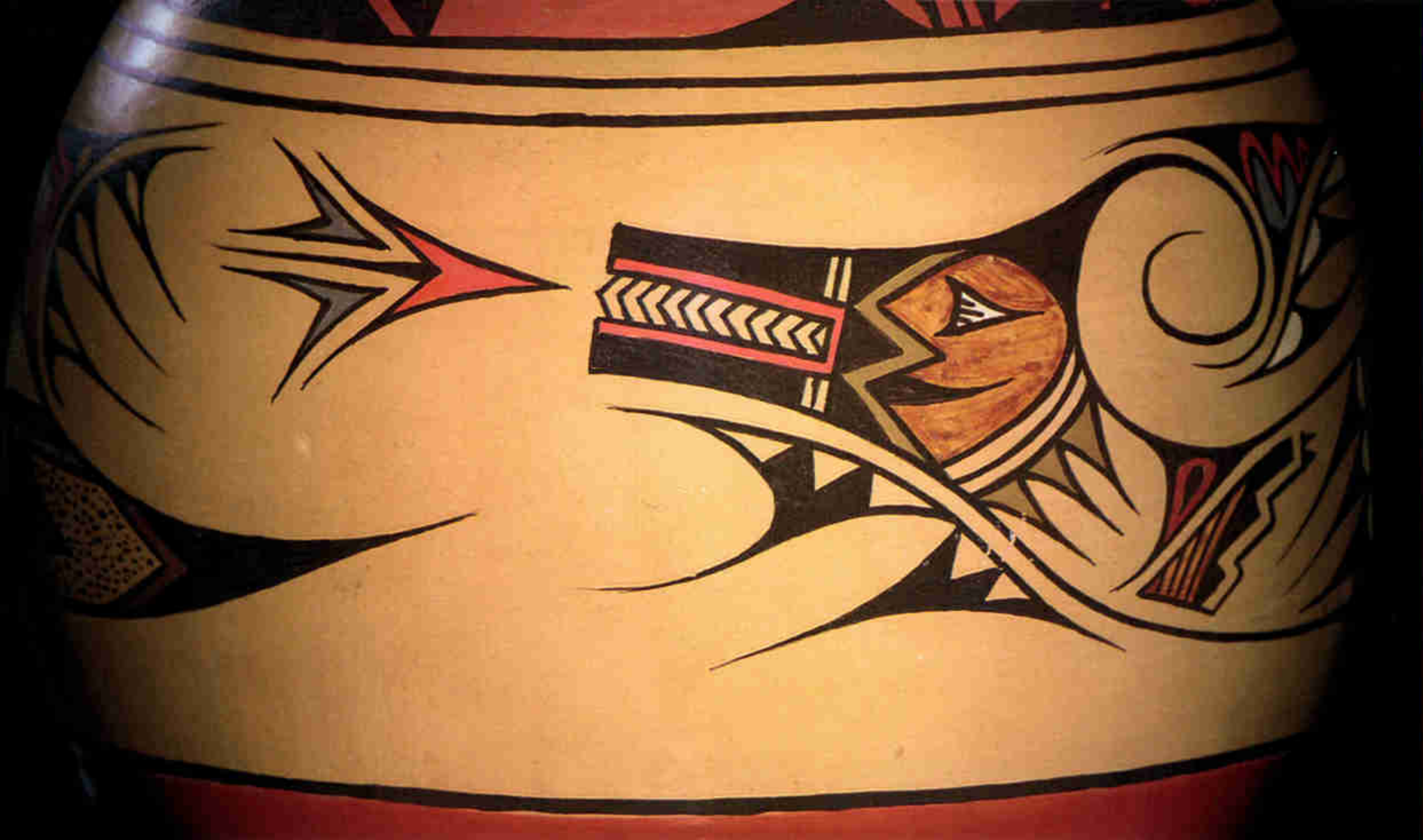
Indeed, long before paleontologists arrived to excavate the fossils of marine reptiles, Native American peoples were carrying away enormous bones that lay exposed on the surface. For the Lakota, Cheyenne, and Kiowa (as well as many other tribes), the bones held special powers and could be used for healing or other rituals. And, as Locke explained, the bones were also "the physical manifestation of the evil forces the *Unktehila* represented."

Although Locke had learned about the *Unktehila* from his elders and had sung the prayers of the Thunder Feast many times, he'd never seen the kinds of fossils that likely inspired the stories. So we went to the Museum of Geology at the South Dakota School of Mines and Technology in Rapid City, where skeletons of a plesiosaur and mosasaur are on display. These and other marine reptiles had lived in the ocean that covered much of North America about 75 million years ago.

"Wow," he said, nodding appreciatively at the long-necked, fat-bodied plesiosaur. But it was the massive-jawed mosasaur that held his



Real sea monsters inhabited the Western Interior Seaway that split North America some 75 million years ago.



Water serpents abound in Native American lore. Some are evil and some—like Avanyu (above, on a redware jar)—are good. “We hold the Avanyu dear to our hearts,” says artist Kathy Naranjo, a Pueblo Indian from New Mexico, “for it is water and life to our people.”

attention. “Now this one,” he said, pausing to size up the 29-foot-long snaky animal, with its fierce array of teeth and double-hinged lower jaw joint that allowed it to swallow large kinds of prey (including other mosasaurs). “This one is an eating machine. If our people found one of these, I’m sure they would call it Unktehila.”

And, Locke added, mosasaur-like creatures with toothy jaws and horns were often painted on the tepee covers of the Kiowa, Cheyenne, and Blackfeet. Some Native Americans had carved images of such creatures into the rocks above the Missouri River, and others had made one out of stones along the river’s banks. “Everyone who sees these knows they’re Unktehila.”

Paleontologists often find bones of pterosaurs, flying reptiles, along with the mosasaurs. Adrienne Mayor, a folklorist, suggests that pterosaur and mosasaur remains may indeed have triggered the stories of the Thunder Birds and their battle with the water monsters.

Do the Lakota, like the people who wait for

Nessie to surface, regard the Unktehila as still existing? Locke hesitated. “Well, the old Unktehila were killed by the Thunder Birds. That’s what our stories say. Some people still fear large bodies of water, and they’ll say prayers to protect themselves from Unktehila when crossing the Missouri River.”

But, he went on, the power of the Unktehila lies more in what they symbolize than in any hard reality. “They were a negative force and had to be destroyed. That’s what the Thunder Birds did for the world. And that’s why it’s important for us to keep these stories alive. Because there are still negative forces—many that are even more powerful than water monsters—in the world today. We have to fight against things like alcohol and depression and materialism. These are the new Unktehila. We can fight them with our songs and music.”

And that’s why Kevin Locke sings about sea monsters for the children: To remind them of their heritage and to tell them about the ancient battle fought to bring goodness into the world. •

“Some people still fear large bodies of water, and they’ll say prayers to protect themselves... when crossing the Missouri River.”



Big as a Sub

Giant ichthyosaurs swim through waters that once covered much of North America. This species, *Shonisaurus sikanniensis*, may have been 75 feet in length, longer than a sperm whale. Its sleek shape and nostrils atop its snout like a blowhole conjure further comparisons to whales. A vertical tail fin, though, gave its back end more the look of a shark. Giant ichthyosaurs cruised the open ocean, where they gave birth to live young. In 1998 a team led by the late paleontologist Elizabeth Nicholls began excavating the skeleton of a giant ichthyosaur that represents the largest marine reptile ever found. The skull of the beast, unearthed in British Columbia, came from a block of stone weighing four tons. Dozens of other giant ichthyosaurs had been found previously in Nevada, fossilized in the same orientation, leading some scientists to suggest that they traveled in pods like modern whales.

MONSTER FACTS

WHAT *SHONISAURUS SIKANNIENSIS*
WHEN 220 TO 210 MILLION YEARS AGO
WHERE NORTH AMERICA







Bottom-feeder

Drifting along the floor of a shallow, briny lagoon in what is now Germany, *Henodus* is among the oddest of the ancient sea's oddballs. Though it looks like the unloved offspring of a turtle and a manta ray, this creature can claim a link to neither. "*Henodus* is one of the weirdest fossils," says paleontologist Olivier Rieppel. Wider than it was long, with a bony carapace for a shell, *Henodus* was part of an ancient group of marine reptiles called placodonts, which used flat teeth to crush bottom-dwelling shellfish.

MONSTER FACTS

WHAT *HENODUS CHELYOPS*

WHEN 225 MILLION YEARS AGO

WHERE EUROPE

ART BY JEFFREY SANGALLI

Eyes in the Dark

Belemnites, squid-like cephalopods, scatter as a hungry *Temnodontosaurus* attacks, powerful jaws ready to latch onto prey. With eyes among the largest ever known in nature—more than 10 inches across—*Temnodontosaurus* could see in almost complete darkness and dive

deep for food. Scientists look to the behavior of modern beaked whales for an indication of how deep *Temnodontosaurus*, a type of ichthyosaur, could dive. Some experts estimate that it could stay submerged for 20 minutes between breaths and dive as deep as 2,000 feet. With a name that means “cutting tooth

lizard,” it didn’t really matter that *Temnodontosaurus* was roughly half the length of the giant ichthyosaurs of earlier times; it was the bully of its period and sat at the top of the ocean food chain.

MONSTER FACTS

WHAT *TEMNODONTOSAURUS*
PLATYODON

WHEN 195 TO 175 MILLION YEARS AGO

WHERE EUROPE

▶ **COME EYE TO EYE** with this *Temnodontosaurus* at ngm.com/0512.



ART BY DAMNFX



HAI LONG

CHINA'S GOOD-LUCK MONSTERS

"This is Lurking Dragon Hill," explains our guide, Cen Zhuxian, as Jiang Dayong, a paleontologist at the University of Peking, and I hike up a steep, cobbled trail above the city of Xingyi in China's southern Guizhou Province. Surrounded by countryside as green as seaweed, we stop just shy of the top of one of the rounded hills that rise above the rice paddies and cornfields. "It was here that the local people used to find their small dragons. They didn't know they were fossils, but they liked them because the dragon is a sign of good luck."

In a shallow pit along the hillside several workers are busy excavating more of those little dragon fossils: 12- to 14-inch-long marine reptiles called *Keichousaurus hui*. The Guizhou dragons, as they're popularly known, with their pear-shaped bodies and sinuous necks, look like miniature Nessies. But for centuries the local people regarded them as dragons whose spirits could travel between heaven and earth.

No one knows when the Chinese belief in dragons began, but it extends back thousands of years. With serpentlike scaly bodies, horses' heads, and blazing rabbit eyes, the dragons inhabited ponds and rivers and could fly on bat wings to the heavens in spiraling water-spouts. If times were hard and drought stalked the land, people gave them offerings, asking them to breathe out mists and clouds and their heavenly rain.

Some Chinese dragons are considered evil, such as the Chien Tang River monster and the seagoing, red-maned Shan, but overall they're benevolent, embodying fecundity and good fortune. In the distant past some dragons were transformed into Sea Dragon Kings, *Hai Long Wang*, who lived in the oceans and protected seafarers. Not surprisingly, early Chinese rulers embraced the dragon as a symbol of imperial power, putting its image on everything from their

thrones and royal robes to the country's flag.

And not surprisingly, the farmers of Lurking Dragon Hill weren't worried by the small creatures they'd found. In fact they used the fossil-bearing stones to build the walls of their homes.

"They thought this mountain was very special," says Cen Zhuxian, as we watch the workers dig. "And so 150 years ago, 45 farmers here collected a thousand silver coins to buy and preserve Lurking Dragon Hill."

More than a hundred years would pass before scientists recognized what the farmers already knew: This mountain was worth saving. In 1957 a professor from Beijing visited Xingyi, and the farmers showed him their dragons. He took the fossils to Young Chung-chien, one of China's first paleontologists, at the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing.

"Professor Young knew they were very important," says Jiang Dayong.

Until then, most of the prehistoric seagoing reptiles had been unearthed in the U.S., England, Scandinavia, and elsewhere in Europe. The Lurking Dragon Hill fossils, the first such fossils found in China, were so abundant and well preserved that they promised to answer many puzzling questions about these long-extinct reptiles. Most important, Jiang says, was to find out how they had left their terrestrial homes to find a new life in the ocean.

"We know that many species made this journey," says Jiang, explaining that many of the marine reptiles clearly evolved from different land-based ancestors. In the past decade, he continues, researchers "have found complete skeletons of many species in Guizhou Province; some are very early types, close to the time of the transition from land to sea."

Jiang had shown me one such specimen in his university office. It was an early species of ichthyosaur, recently unearthed at a site near



Four women at the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing underscore a 19-foot, 200-million-year-old ichthyosaur from southern China.

Xingyi. I'd seen full-fledged ichthyosaurs before, but this creature looked like something assembled from a Dr. Seuss storybook. It had a python's slinky torso, a penguin's flippers, and a lizard's skinny tail. Its snout was narrow, like the long beak of a heron, and it had a heron's large eye sockets too. It was as curiously wonderful a beast—and as monstrous—as anything Seuss had ever concocted.

"We're looking for more creatures like this," Jiang told me.

At Lurking Dragon Hill, scientists and their farmer-helpers keep up the search. One team of researchers studying *Keichousaurus* fossils has discovered that those small creatures did not come ashore to lay eggs, as sea turtles do, but gave birth in the water to living young—a necessary first step to becoming a seagoing plesiosaur. This and other discoveries from around the world have sparked a renaissance in the study of the still little-understood marine reptiles.

"It's because the preservation is so perfect that

we can see these things [embryos]," says Jiang, as a worker pulls aside a tarp to reveal an astonishingly perfect *Keichousaurus*: every rib and vertebra visible, every delicate finger, the slender nasal passages. It's as if the animal had been skinned on a dissecting table. The worker gestures at another tarp covering an expanse of the hillside.

"He says there are 68 more of these fossils beneath the tarp," Jiang translates. "They're all lying close together on one slab, and the workers are going to make an outdoor museum for their visitors."

With such a stunning exhibit in place, local people dream that the government will declare Lurking Dragon Hill a national geological park. Then more tour buses will stop here, and people from all over the world will pay to see the dragons the farmers found and protected.

"They have always brought us good luck," the worker says, turning back to his excavation. Like benevolent Chinese dragons, they're passing their good fortune on to their finders. •

With serpentlike scaly bodies, horses' heads, and blazing rabbit eyes, the dragons inhabited ponds and rivers.





Advantage: Swimmers

Hatchling nothosaurs head for the safety of water as a hungry but terrestrial *Ticinosuchus* shows up near a lagoon in ancient Switzerland. Nothosaurs were among the earliest reptiles to take to the sea and were closely related to plesiosaurs. Because nothosaurs may have had to come ashore to lay eggs, the eggs and hatchlings would have been vulnerable to *Ticinosuchus*. Yet once the hatchlings reached deeper water, they were safe—for the moment.

MONSTER FACTS

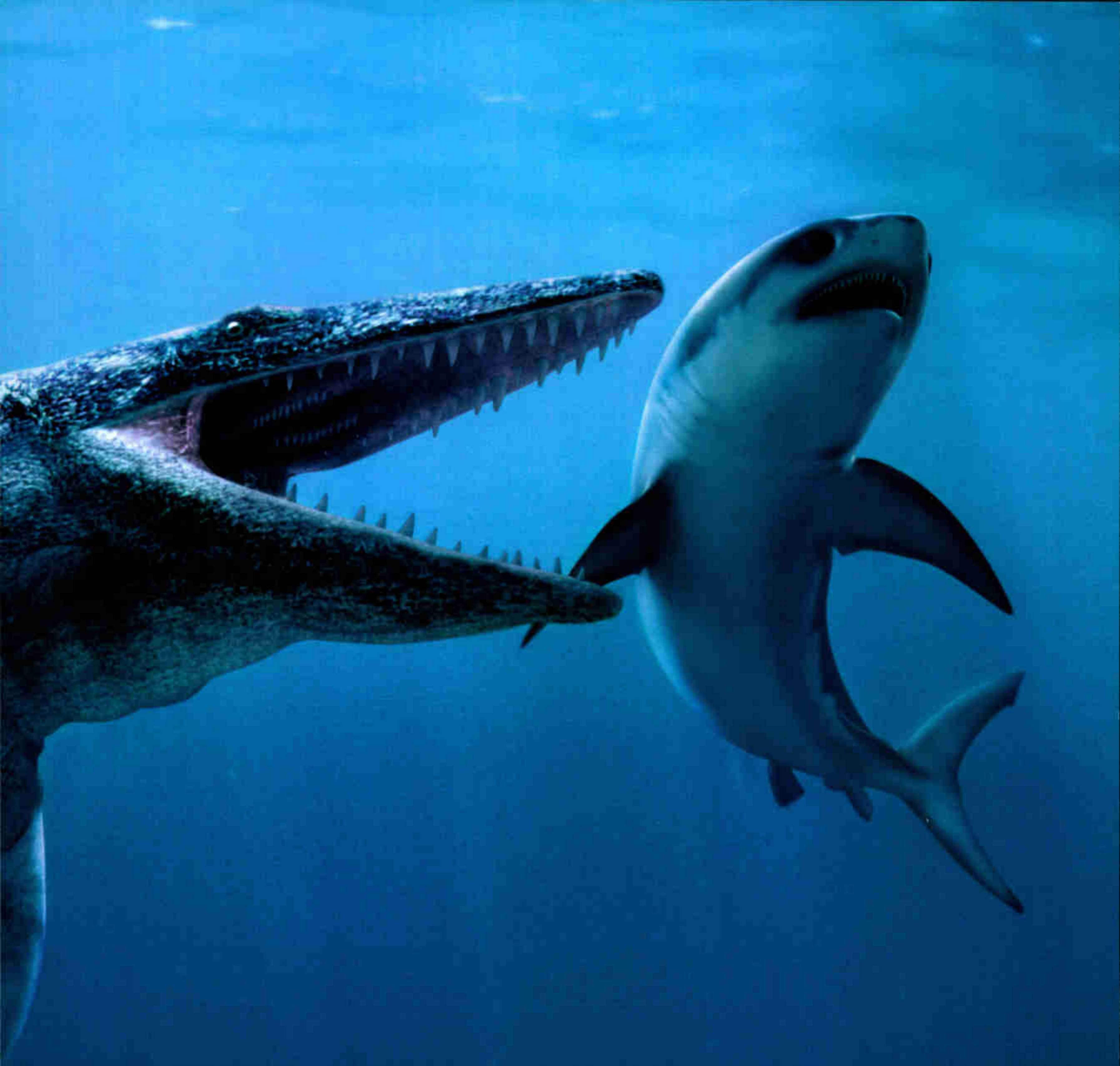
WHAT *NOTHOSAURUS GIGANTEUS*

WHEN 230 MILLION YEARS AGO

WHERE EUROPE

ART BY DAMNEX





Predators Then and Now

Among the last great marine reptiles, *Tylosaurus*, shadowed by an offspring, drives away a shark, *Cretoxyrhina mantelli*, in North America's Western Interior Seaway. Part of a group of carnivores called mosasaurs, whose



fossils are found on every continent, *Tylosaurus* measured roughly 45 feet long. Gut contents from one beast suggest that it scavenged sharks and perhaps even attacked them. However, recent finds of *Cretoxyrhina* teeth embedded in mosasaur vertebrae indicate that the reptilian predator also became prey—or at least

suffered its share of scrapes. Sharks proved themselves true survivors, outlasting the extinction of all the marine reptiles, except sea turtles, 65 million years ago, when volcanic eruptions, climate change, and a meteorite impact ended the reign of the reptiles. □

MONSTER FACTS

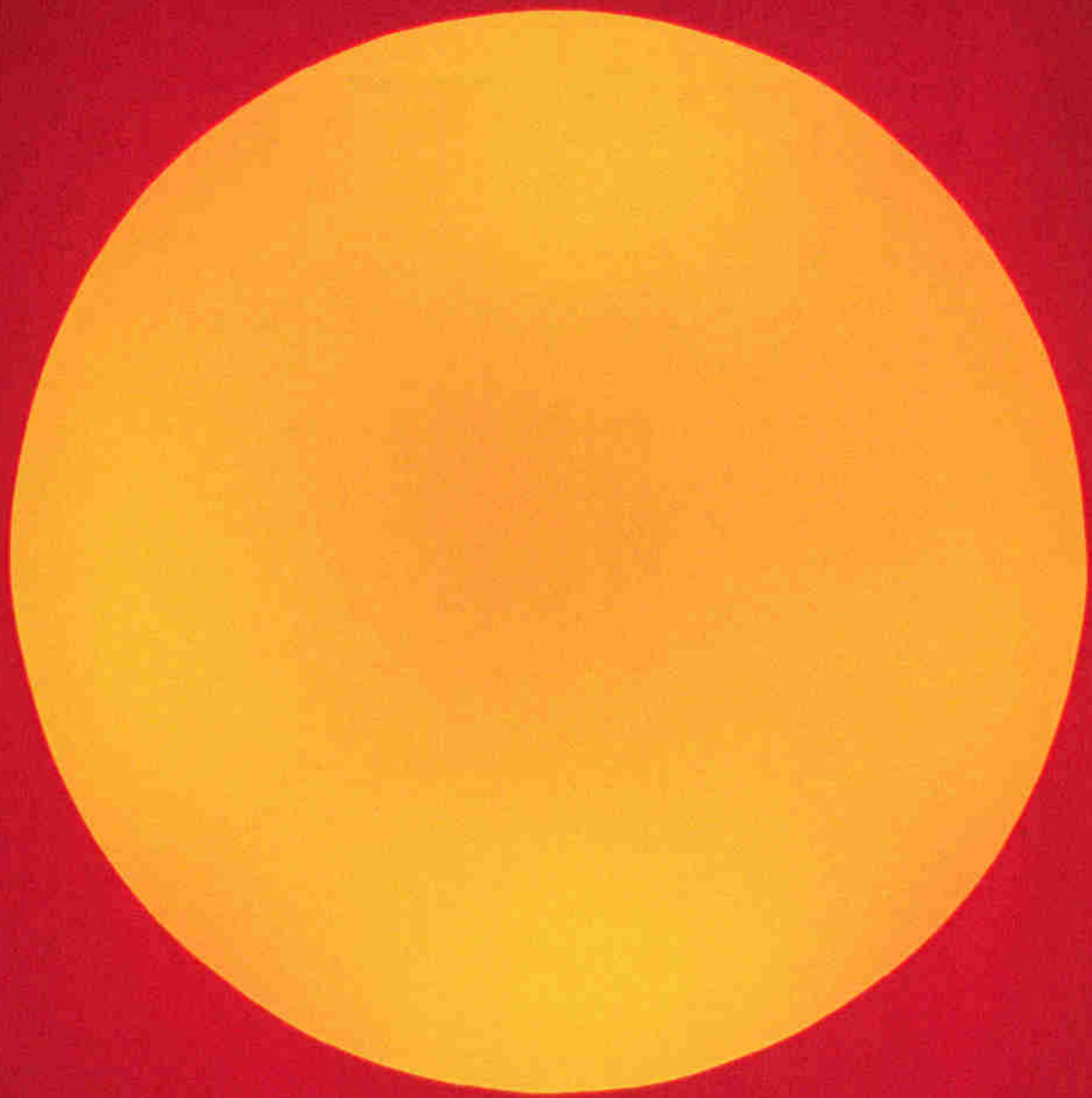
WHAT *TYLOSAURUS PRORIGER*
WHEN 85 TO 73 MILLION YEARS AGO
WHERE NORTH AMERICA



BUDDHA RISING

Out of the monastery, into the living room

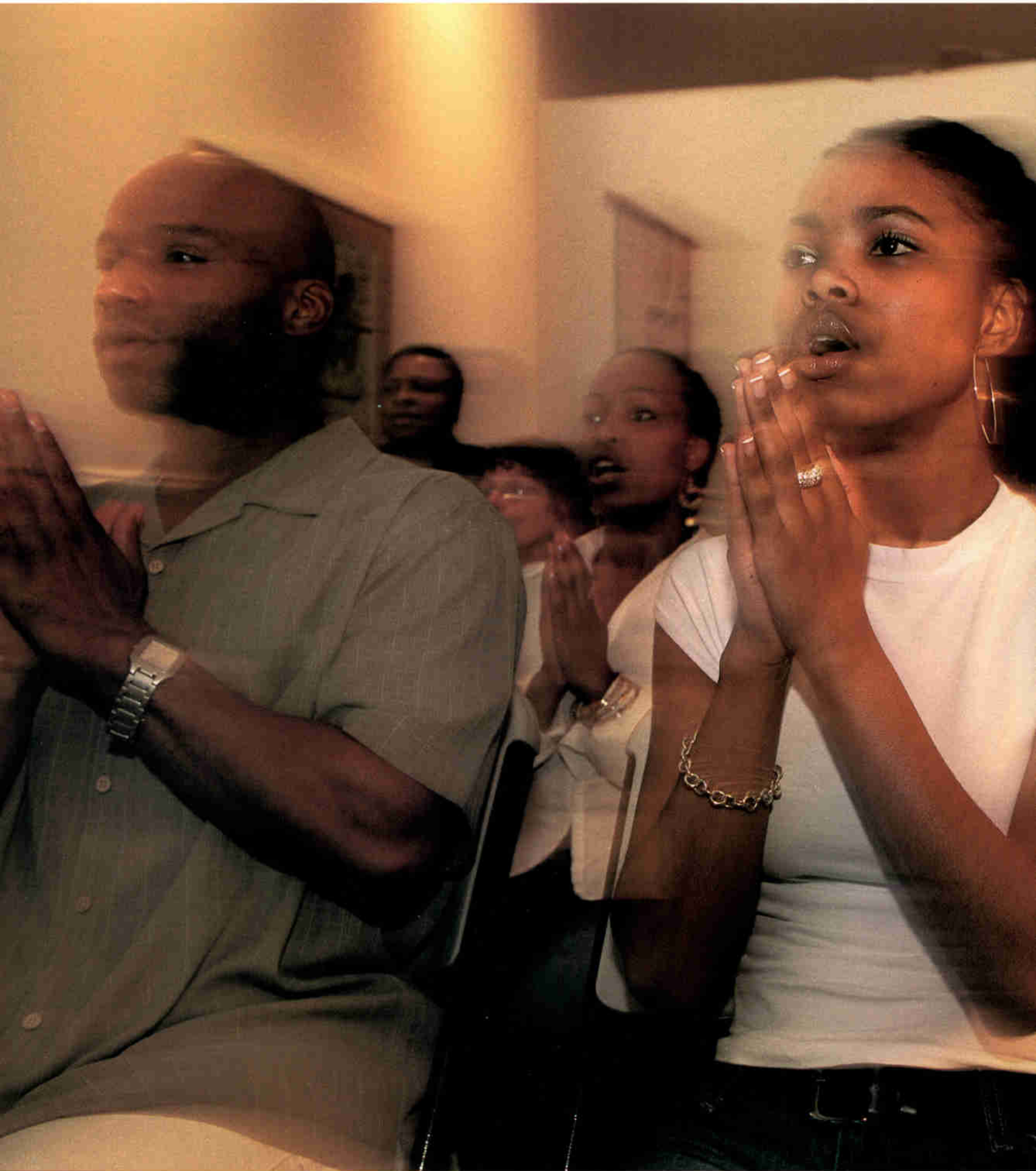
Practitioners at Colorado's Shambhala Mountain Center use color to gain clarity and compassion.







Looks like a hit: Monks at Nova Scotia's Gampo Abbey practice for their annual softball game against the local volunteer fire department. "We always get trounced," says Ngedon Sangpo, far left. "But all we want is a good game." The monks lost, 19-7, but Buddhism is gaining Western followers drawn by its ideals of pacifism, selflessness, and social action.





People gather at the home of Paul Pryde (purple shirt) in Washington, D.C., to practice Soka Gakkai, one of many sects to flower from Buddhism's source: the 2,500-year-old teachings of Siddhartha Gautama. "Whether you're happy or not has less to do with circumstances than with how you perceive them," says Pryde. "Buddhism offers a regimen to live a happier life."

BY PERRY GARFINKEL

PHOTOGRAPHS BY STEVE McCURRY

The man who taught me the most about Buddhism wasn't a monk with a shaved head. He didn't speak Sanskrit, and he didn't live in a Himalayan monastery. In fact he wasn't even a Buddhist. He was Carl Taylor, a lifelong San Franciscan who looked to be in his late 40s. At the moment, he appeared cold, sitting upright in a bed rolled into the gardens off the hospice ward at Laguna Honda Hospital. It was a blue-sky summer afternoon, but in this city that often means a bone-penetrating chill. Carl was dying of cancer.

I was spending a week with the Zen Hospice Project, a Buddhist organization whose volunteers assist the staff of the 25-bed hospice unit at the hospital, perhaps the largest public long-term care facility in the United States. The project, now emulated around the world, uses two of Buddhism's central teachings—awareness of the present moment and compassion for others—as tools to help bring a degree of dignity and humanity to those in the last stages of their lives. They're not easy lessons to learn.

I sat beside Carl, helping adjust the well-worn jacket he used as a blanket. He wore his terminal diagnosis with resigned bravado. I tried to make small talk, but it was going terribly. What solace can you offer someone who doesn't have long to live and knows it?

"So what kind of work do, er, did you do?"

Long silence. Slow drag on his cigarette. An eternity passed as we watched a white tuft of cloud break the blue monotony and move across the sky.

"I don't really talk about my past."

OK. Squirming to keep the conversation moving, I mentally scrolled through my list of questions. If I couldn't ask about the past and there was no sense in asking about the future, that left

only the present. And in the present, I was learning, there are no questions; there is just being. This made me feel awkward at first: Stripped of his questions, the journalist has no identity.

But Carl seemed content to have me just sit there, my company alone helping ease some of his suffering. Once I accepted that I had nothing to do and nowhere to go, I relaxed. Carl looked sideways at me and smiled. We both understood I had just learned a small lesson. Together we watched another white cloud go by.

That week there were other lessons drawing on Buddhism—lessons about the impermanence of life, about our attachment to the way we want things to be, and our disappointment when those things don't come to pass. About physical and mental suffering and about the value of what Buddhists call *sangha*, which best translates as "community." But most of all I saw how the lessons one man learned in India 2,500 years ago have been adapted to the modern world.

Around the globe today there is a new Buddhism. Its philosophies are being applied to mental and physical health therapies and to political and environmental reforms. Athletes



India's Mahabodhi Temple is steps from where Siddhartha achieved enlightenment and became the Buddha. His Four Noble Truths: Life entails suffering; suffering arises from attachment to desires; suffering stops when attachment does; to transcend life's pains, follow the Eightfold Path. A key practice is meditation.

use it to sharpen their game. It helps corporate executives handle stress better. Police arm themselves with it to defuse volatile situations. Chronic pain sufferers apply it as a coping salve. This contemporary relevance is triggering a renaissance of Buddhism—even in countries like India, where it had nearly vanished, and in China, where it has been suppressed.

Buddhism is no longer just for monks or Westerners with disposable time and income to dabble in things Eastern. Christians and Jews practice it. African Americans meditate alongside Japanese Americans. In the U.S. alone, some experts estimate, there are roughly three million practicing Buddhists. And according to a 2004 study, more than 25 million Americans believe that Buddhist teachings have had an important influence on their spirituality.

The Zen Hospice Project is one example of “socially engaged Buddhism,” a term coined

by the Buddhist monk Thich Nhat Hanh, who was exiled from Vietnam in the 1960s for his nonviolent antiwar activities. Still engaged at the age of 79, he traveled in his native country for three months this year—the 30th anniversary of the Communist Party takeover of Vietnam—spreading Buddhist teachings where he had once been a pariah.

In southwestern France, at his Plum Village meditation center, he regularly hosts, among others, Palestinians and Israelis in workshops on conflict resolution and peace negotiation. These sessions often begin with animosity, Hanh tells me, and just as often end with embraces.

“It all starts with a spin on an old adage: ‘Don’t just do something, sit there,’” he says in a wisp of a voice. A rail-thin man with large ears and deep-set eyes, Hanh is sitting on the porch of his cottage overlooking verdant Bordeaux vineyards. “With all this socially engaged work,



first you must learn what the Buddha learned, to still the mind. Then you don't take action; action takes you."

SIDDHARTHA GAUTAMA, who later came to be known as the Buddha, was born around 500 B.C. near the foothills of the Himalaya, the son of a local king. In the centuries after his death, as his reputation grew, fact intertwined with myth, and a legendary Buddha was born as well. In one version the Buddha toddled out of his mother's side at birth and took seven steps in each cardinal direction, with lotuses appearing under his feet.

Most versions agree, however, that at age 29 the married prince, disillusioned with his opulence, ventured out of his palace and for the first time encountered old age, sickness, and death. So moved was he by this brush with the painful realities of life that he left his comfortable home to search for an end to human suffering. For six years he withstood all the deprivations of his fellow seekers—he fasted, he observed silence, he lived alone in a cave—until he realized he had not found what he sought.

There must be another way, he thought, a "middle way" between indulgence and asceticism. He decided to sit in meditation under one of the broad pipal trees that dotted the plain of the Ganges River until he found his answer. He examined his thoughts to discover how and why human beings often create their own mental suffering. He emerged from under the shade of the tree as the Buddha, which simply means "enlightened one." (The tree, *Ficus religiosa*, is now known as the bodhi tree.) Until his death



at 80, the Buddha traveled the corridor of what are now India's Bihar and Uttar Pradesh states, sharing his insights with all who would listen.

His ideas were based not on faith, as in other religions, but on empirical observation, starting with his own outside the palace. He arrived at Four Noble Truths:

1. There is suffering in the world, whether mental or physical.
2. Suffering occurs because of too great an attachment to one's desires.
3. By eliminating the cause—attachment—you can eliminate suffering.
4. There is a method to eliminating the cause,



Canned food, chocolate, even potato chips—almost any vegetarian donation is welcome when the monks of California’s Shasta Abbey collect monthly alms. In return they live simply and strive to conquer the passions that can lead people astray. Nuns in Yangon, Myanmar (opposite), also rely on the local community—as did the Buddha himself.

called the Eightfold Path, a guide to “right” behavior and thoughts. The Eightfold Path is a moral compass leading to a life of wisdom (right views, right intent), virtue (right speech, conduct, livelihood), and mental discipline (effort, mindfulness, concentration).

One of the key practices of the Eightfold Path is meditation. Though the technique may differ

from sect to sect—alone or in groups, facing a wall or fellow meditators, eyes closed or slightly open, in silence or chanting phrases—many types begin by paying close attention to your own breathing. There is nothing mystical or otherworldly about it, no levitation, no out-of-body experience. With each in and out breath, your awareness becomes more refined, more focused.

Buddhism's path to **GOING GLOBAL**

A PRINCE AWAKENS

Born in what is now Nepal around 500 B.C., Siddhartha Gautama was a prince who left his regal life to seek an end to suffering. After his death, the Buddha's disciples spread the word.

EXPANSION IN ASIA

Monks took Buddhism south to Sri Lanka and Southeast Asia, north to Central Asia, China, and Japan, and later north again to Tibet.

REACHING EUROPE

European intellectuals imported Buddhism in the 1800s, but numbers remained small and largely European until Buddhist Asian immigrants arrived in the late 1900s.

EAST TO AMERICA

Chinese seeking gold brought Buddhism to California in 1848. Japanese sent to harvest sugarcane in Hawaii soon followed. The 1960s brought a new influence: immigrants from Southeast Asia. Roughly three-quarters of American Buddhists are Asian.

World Population,
2005: 6.5 billion



BEYOND ASIA: BUDDHISTS BY REGION

373 million (98%) of the world's Buddhists live in Asia. The other 6 million (2%) live in:



SOURCE: WORLD CHRISTIAN DATABASE



Breathing in . . . you become aware of the sensations of your body, and of your most distracting organ, your mind. Breathing out . . . you experience a release of body tension, and you struggle to bring your wandering mind back to your breath. In . . . the air tickles the tip of your nose. Out . . . the pain in your knee subsides, the mind still meanders. In . . . Shouldn't I be doing something more useful with this time? Out . . . Who's the "I" in that last thought? With ever more subtlety, eventually you come to understand, sometimes painfully, sometimes joyfully, what the Buddha realized. "We are what we think," he said.

The Buddha did not intend his ideas to become a religion; in fact, he discouraged following any path or advice without testing it personally. His dying words, as it's told, were: "You must each be a lamp unto yourselves." Nonetheless, within several hundred years of his death, the Buddha's teachings had taken strong hold. Today, with 379 million followers, Buddhism is the world's fifth largest religion, behind Christianity with 2.1 billion followers, Islam with 1.3 billion, Hinduism with 870 million, and traditional Chinese religion with 405 million.

Some people argue that the Buddha was right, that Buddhism should not be categorized as a religion but as a philosophy or form of psychology. After all, unlike other religions, there is no supreme being, and it encourages you to question—even challenge—authority.

There are those in my generation, growing up in the latter half of the 20th century, who were attracted to these traits of Buddhism. It was non-dogmatic (we distrusted authority); it relied on evidence you could test with your own senses (ours was the age when science became the new god); it suggested that you, not some external force, hold the answers to your own happiness (we were on the front lines of the Me Decade); it saw your mind as both the obstacle and the key to truly understanding yourself (enter Dr. Freud and psychoanalysis).

While many Europeans and Americans are drawn to the ornate and complex rituals of Tibetan and Japanese Zen Buddhisms, others seem to prefer the simplicity of Southeast Asia's Theravada Buddhism. From that tradition, I practice *vipassana*, "insight" or "mindfulness" meditation. This has not brought me enlightenment—yet—but it has helped bring



Rising each morning and deflating each night, Paranirvana—a 26-foot-long Buddha on exhibit at Ohio’s Columbus Museum of Art—represents life’s impermanence, says artist Lewis deSoto. The artwork captures the pose of the Buddha as he died and passed into nirvana.

into sharper focus some of the questions I grapple with: Who am I? Why am I here? How can I achieve lasting happiness?

IN A TRIBUTE to Buddhism’s adaptability, the same meditation technique I use has become the centerpiece of an innovative prison reform program spreading throughout India.

“I’m not doing time, I’m doing vipassana,” says prisoner Hyginus Udegbe. Having waited four and a half years for his cocaine possession case to be heard, Hyginus, who is Nigerian, has been kept at Tihar Jail Complex in New Delhi. It’s one of Asia’s largest prisons, with almost 13,000 inmates, more than twice its capacity. The overcrowded conditions, inadequate sanitation, and a staff that sometimes resorts to oppressing and dehumanizing prisoners make it a living, incarcerated hell.

But for Hyginus and thousands of other inmates in India, practicing vipassana has transformed prison into an oasis for self-reflection and rehabilitation. There are silent ten-day retreats

every other week in a section of Jail No. 4, cordoned off as a permanent retreat site. Prisoners can repeat the sessions every three months, and many do.

“I had high blood pressure and couldn’t sleep,” says Hyginus, a barrel-chested, bald six-footer who looks more like a prizefighter than the meditating type. Behind us, painted on a high wall is a yellow wheel, the traditional symbol of the Buddha’s teachings, or *dharma*. “After my first retreat here,” Hyginus says, “my pressure dropped, and I slept ten hours. I used to have quick temper. Now I feel like a dove, very peaceful. I am so much happier.”

I am struck even more by a conversation with a man who has been a Tihar prison officer for 14 years. He’d done three retreats here, all voluntarily. “I just wanted to experience for myself this thing I had heard about, vipassana,” he tells me. “Before the course, I used to beat the prisoners. I felt so much stress it turned me into a monster. After the course, I felt more human.” Now prisoners come to him for counseling.



Bearing witness to the Holocaust, Grover Gauntt meditates during an annual Buddhist-led retreat at the Auschwitz-Birkenau death camp, where more than a million people, mostly Jews, were killed by the Nazis. Where does such evil come from? "It's in each of us," says Gauntt, co-leader of the interfaith retreat. "Each of us has to face it, own it, deal with it."





"We are all prisoners—of our minds," says Satya Narayan Goenka, an 80-year-old Burmese businessman turned meditation teacher who has spearheaded the vipassana resurgence in India. "Where better to recognize this than behind bars?" Indeed, in prisons around the world, meditation groups now meet regularly. Practicing these techniques, studies show, prisoners ease their own suffering and inflict less on others.

"I'm not teaching Buddhism," Goenka tells me emphatically when I meet him at his home in Mumbai. He's a big but graceful man, with a booming bass voice. "I am not interested in converting people from one organized religion to another organized religion. I'm interested in converting people from misery to happiness, from bondage to liberation, from cruelty to compassion.

"There's no mystery to it," he continues with a chuckle, his ample belly shaking. "Vipassana means 'to see things as they really are.' After watching your breath for a few days, you begin to pay close attention to your sensations. You realize very quickly that you are obsessed with cravings—food, warmth, all sorts of desires—and aversion to unpleasant things. Then you realize the impermanence of it all. Everything changes. From these simple understandings, discovered by each person starting with Buddha himself, an entire doctrine eventually unfolds."

AS BUDDHISM MIGRATED out of India, it took three routes. To the south, monks brought it by land and sea to Sri Lanka and Southeast Asia. To the north, they spread the word across Central Asia and along the Silk Road into China,



from where it eventually made its way to Korea and Japan. A later wave took Buddhism over the Himalaya to Tibet. In all the countries, local customs and cosmologies were integrated with the Buddhist basics: the magic and masks of demon-fighting lamas in Tibet, the austerity of a Zen monk sitting still as a rock in a perfectly raked Japanese garden. Over centuries Buddhism developed an inclusive style, one reason it has endured so long and in such different cultures. People sometimes compare Buddhism to water: It is still, clear, transparent, and it takes the form and color of the vase into which it's poured.

And yet from the start, the spread of Buddhism



Holding on while letting go, cancer patient Suzanne Lewis-Abed receives comfort from her daughter and Robert Chodo Campbell, a Buddhist chaplain, at a hospice in New York City. “In Buddhism there is no birth or death,” Campbell says, “just transitions.” Noah Levine, who runs a meditation program for young prisoners, lets his tattoos do the talking (opposite).

—a peaceful process in itself—has periodically met with hostility. In China, in A.D. 842, the Tang Emperor Wuzong began to persecute foreign religions. Some 4,600 Buddhist monasteries were annihilated, priceless works of art were destroyed, and about 260,000 monks and nuns were forced to return to lay life.

History repeated itself with the Chinese

Communist Party’s attempt to suppress Buddhism—most visibly in Tibet. According to the International Campaign for Tibet, since 1949 more than 6,000 Tibetan Buddhist monasteries, nunneries, and temples have been destroyed and at least 500,000 Tibetans have died from imprisonment, torture, famine, and war. But today Buddhism in China, like the lotus flower that



emerges from mud, is resurfacing. With more than 100 million practitioners, it's one of the country's fastest growing religions.

On the surface, Chen Xiaoxu is a most unlikely poster child for this renaissance. At 39 she heads one of Beijing's top advertising agencies, but she's better known as a former Chinese television star. She started her agency in the early 1990s, when advertising in China was in its infancy, soon earning success beyond her dreams. "Once I got the taste, I always wanted more and more, bigger and bigger status symbols," she tells me, as we sit in the conference room of her company, Beijing Shipang Lianhe Advertising, in a modern Beijing high-rise. Her long neck and delicate features evoke Audrey Hepburn, whose portrait hangs on the wall behind her, but her warm, empathetic eyes mirror paintings and sculptures I've seen of Guanyin, Chinese Buddhism's female representation of compassion.

Gradually, she says, it took hold—that feeling of emptiness so many people experience when they have all the material possessions they desire. In Buddhism this desire has a nickname: the Hungry Ghost, an appetite that can't be filled.

"Though I had it all—big car, beautiful house, travel wherever I wanted, surrounded by fame and luxury with plenty to share with my family—I was still, somehow, unhappy."

Then someone gave Chen a book about the life and teachings of the Buddha, and she became a serious student of Buddhism. Now one wall of her stark white office is dedicated to pictures of her teacher, Chin Kung, as well as Buddhist statues and paintings. Her employees know to hold phone calls during lunch hour,



when she takes a break to meditate and chant.

A Buddhist in a profession whose goal is to whet the appetites of the Hungry Ghost? What's no less remarkable is that so public a figure as Chen Xiaoxu is openly practicing Buddhism in communist China.

•
WHILE BUDDHISM COMES BACK in China, it's been losing appeal in Japan, long considered the wellspring by Westerners.

"If it doesn't meet the changing needs of modern society, Japanese Buddhism will die," says Rev. Yoshiharu Tomatsu of the Jodo Shu Research Institute of Buddhism in Tokyo.



To get the ground truth about homelessness, Jim Bastien spent three days on a Zen retreat living penniless on the streets of New York City. “I felt what it was like to be invisible,” says Bastien, an executive who usually is the center of attention (opposite). Buddhists stress the unity of all life. “The illusion of separateness,” he says, “is the foundation of all human suffering.”

A third-generation priest in the 800-year-old Jodo Shu Pure Land sect—which emphasizes faith in the saving grace of Amida, another enlightened being, rather than through meditation—the boyish 50-year-old is the head of the Shinko-in Temple. We sip green tea in the small 16th-century wooden temple, situated at the base of Tokyo Tower, Japan’s iconic image of

technological modernity. A club DJ in college, Tomatsu harbored dreams of becoming a music industry executive, but he instead earned a master’s degree in divinity from Harvard University. When he’s not in suits or black robes, he wears khakis and pastel crewneck sweaters draped around his neck with the sleeves tied, Ivy League style.



Sedona Tire and Auto in Arizona receives the blessing of monks and nuns from Kunzang Palyul Chöling, a Tibetan Buddhist center. The visit is part of the center's spiritual outreach, which includes a 20-year nonstop prayer vigil for world peace. As for this shop, something got fixed, says co-manager Barbara Hess: *Right after the ceremony, sales hit an all-time high.*



Most Japanese are “funeral Buddhists,” he says, meaning they partake in Buddhist rituals only when someone dies. With the fast pace and competitiveness of Japanese society, young people in particular find little emotional support or sense of community in the ancient rituals of traditional Buddhism.

“It’s ironic,” Tomatsu says. “As much as Japan has looked to the West for its cultural cues, it has not embraced the engaged Buddhism that has become so important among Buddhists in the West.”

Ironic indeed: Many Westerners first heard of Buddhism through Zen, the Japanese derivative of China’s Chan Buddhism. Zen was popularized by the American Beat Generation of the 1950s: novelist Jack Kerouac, author and radio host Alan Watts, and poets Allen Ginsberg and Gary Snyder, among others. Soon you could take adult education classes in Zen art forms like calligraphy and ikebana (flower arranging) or rituals such as tea ceremony or archery. Once Madison Avenue discovered Buddhism’s selling power, Zen became synonymous with cool, giving birth to dozens of products named Zen, from a skin-care line to an MP3 player.

Tomatsu offers to show me signs that the heart of Japanese Buddhism is at least still beating.

One is an organization he helped establish in 1993. Called Ayus, meaning “life,” it channels about \$300,000 a year to national and international groups working for peace and human rights. Two-thirds of the 300 contributing members are Buddhist priests.

There’s also the sect called Rissho Kosei-kai, founded in 1938 and now boasting 1.8 million households. While firmly planted in the Buddha’s teachings, this organization is different. It’s a lay group—and it emphasizes service to others. Members forgo two meals a month, donating the money to the sect’s peace fund. Rissho Kosei-kai has given about 60 million dollars to UNICEF in the past 25 years.

At the sect’s world headquarters in Tokyo, the imposing central meditation hall has a ceiling-high pipe organ and stained-glass windows—more like a Christian church than a Buddhist temple. Tomatsu and I sit in on a *hoza*, or dharma session, focusing on the social problems that beset Japan but remain conversational taboos: divorce, drug addiction, depression, suicide. In a large, brightly lit multipurpose room,

casually dressed participants, mostly women, sit in metal folding chairs in a loose circle around a facilitator, sharing personal dilemmas such as marital problems, disrespectful kids, and aging parents. After each story, the group issues a supportive round of applause. It’s a reminder that the new Buddhism doesn’t always have to address global issues; the kitchen table can be a war zone too.

Tomatsu also introduces me to Rev. Takeda Takao, a Buddhist priest whom I’d seen leading a protest in front of Japan’s parliament building in the heart of Tokyo. Hundreds of demonstrators had gathered to oppose the national Self Defense Forces’ involvement in Iraq. Amid the chaos, Takao, in a monk’s vest, stood at curbside with several other priests carrying bullhorns, drums, and a banner.

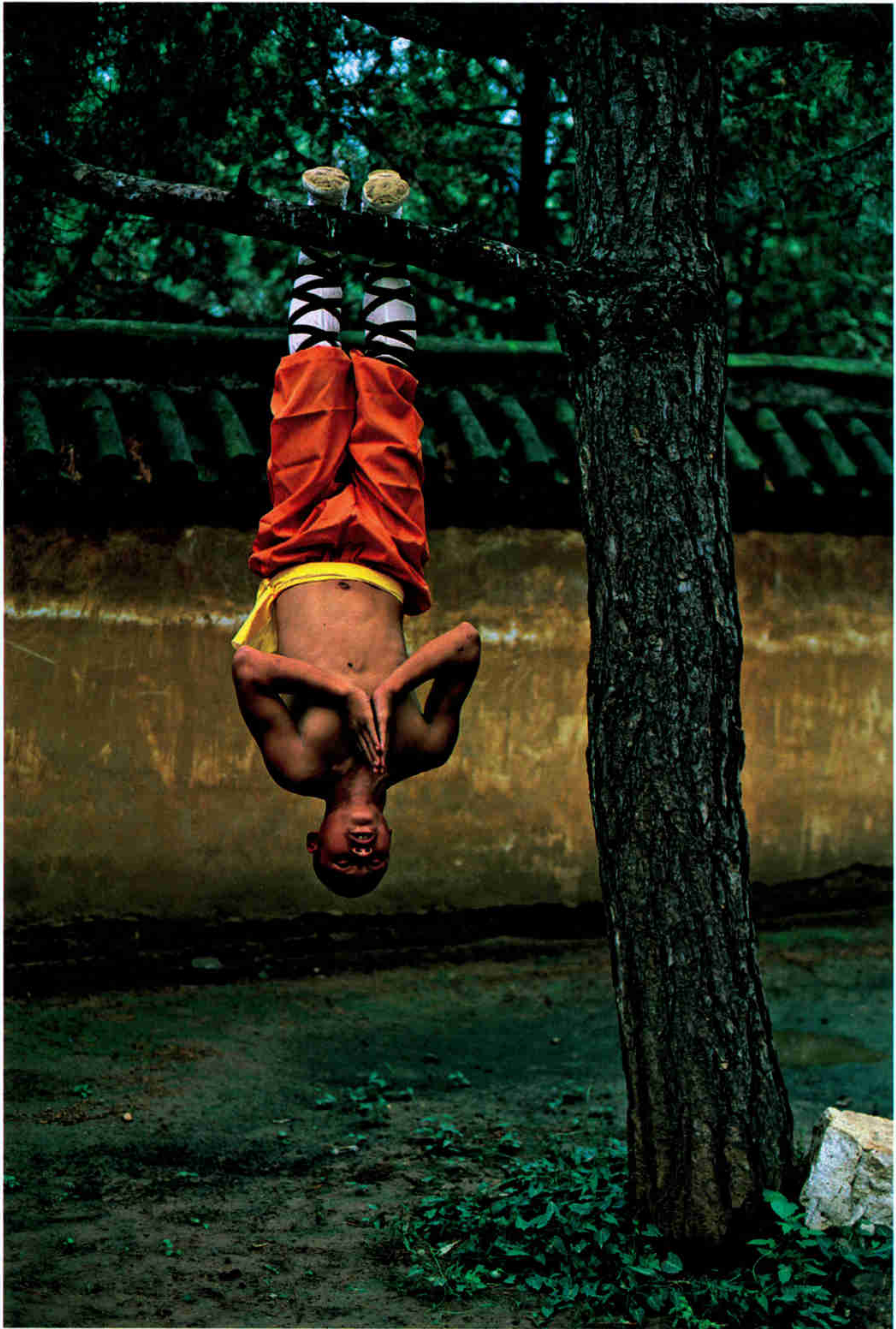
Takao belongs to Nipponzan Myohoji, an international Buddhist organization founded in 1918 whose monks and nuns conduct long peace marches, chanting and beating their drums all the way.

“Peaceful protest is the only way to make a peaceful planet,” he says. It’s a conclusion he came to after participating in demonstrations against the construction of Tokyo’s Narita Airport. In the 1970s several policemen and protesters were killed, and thousands injured, defending the rights of vegetable farmers whose land had been taken by the government for the runway. As a monument to the tragedy, the Nipponzan Myohoji Order erected a peace pagoda in 2001 just outside the airport fences.

Later that afternoon, as my plane takes off from Narita, I catch a glimpse of the tiny white pagoda. It stands out against the gray industrial sprawl, a bright memorial to the Buddha’s timeless message.

Indeed, from Tokyo to San Francisco, from the prison class to the privileged class, a worldwide community of socially engaged Buddhists assures that the tradition remains a powerful force. Back in San Francisco, someone else now occupies the hospice bed that was once Carl Taylor’s. And beside that person is another Buddhist volunteer, just sitting. □

BUDDHIST RENAISSANCE See the West embracing Buddhism in a multimedia show narrated by Steve McCurry. Then find out why Perry Garfinkel calls the Buddha the “world’s first baby boomer” in a video interview at ngm.com/0512.



To see life as it truly is—that's one goal of a student in China who strengthens mind and body under the rigorous tutelage of a Shaolin kung fu master. It's also the goal of millions of followers whose lives hang on the words of the Buddha: "With our thoughts we make the world."





NIGHT VISION

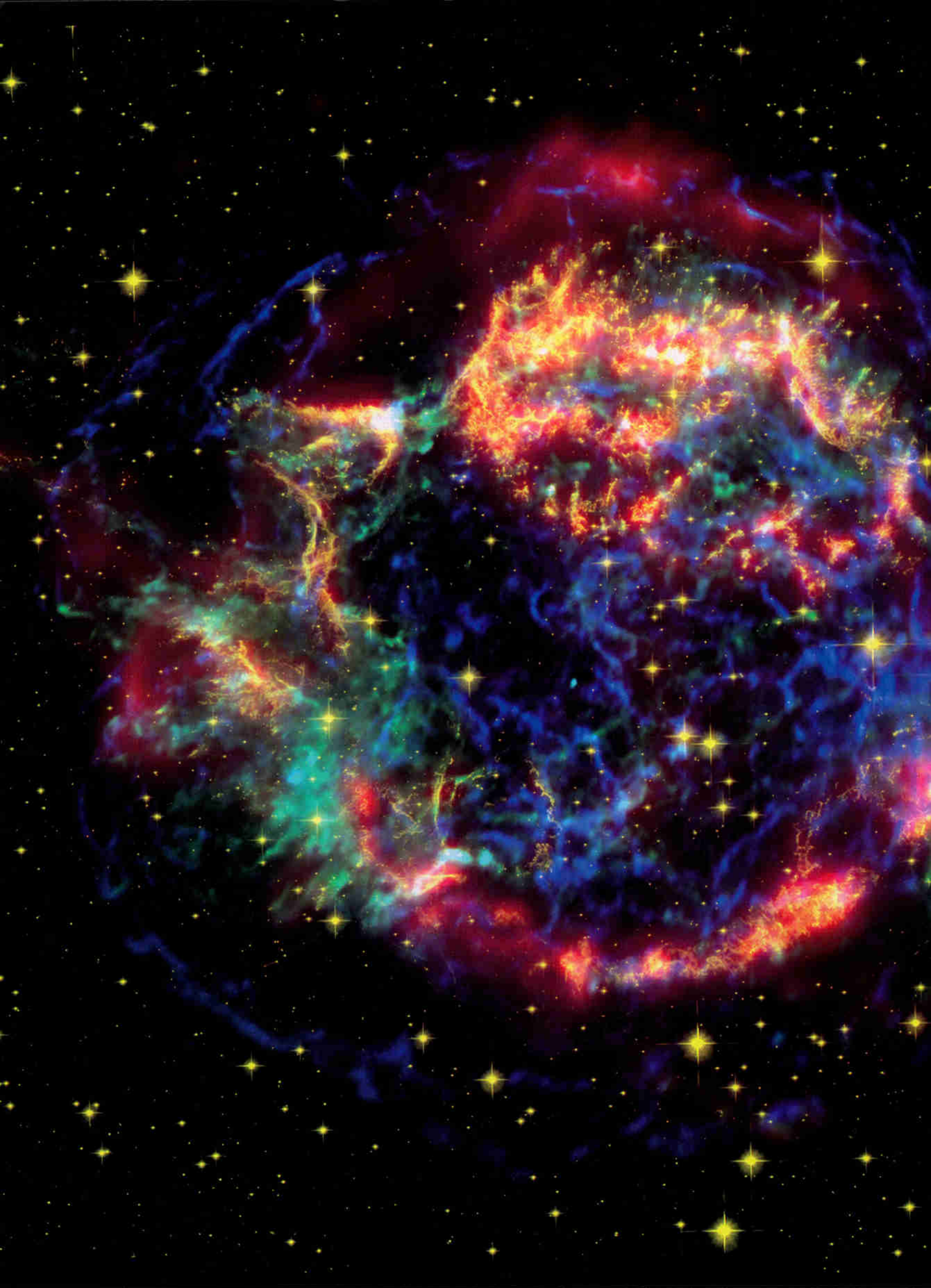
NASA'S SPITZER SPACE TELESCOPE LIGHTS
UP THE HEART OF A DARK UNIVERSE.



NURSERY OF STARS

New stars blaze in a cloud of dust and gas 50 light-years across and 7,000 light-years away. Ultraviolet radiation from a nearby massive star sculpted the cloud into pillars and canyons; then gravity squeezed the denser clumps until stars burst to life, like those atop the pillars. The Spitzer Space Telescope made this image at infrared wavelengths invisible to human eyes.

NASA/JPL/CALTECH/LORI ALLEN AND JOSEPH HORA, HARVARD-SMITHSONIAN CENTER FOR ASTROPHYSICS



There's a lot hiding in the universe's dark corners. Interstellar dust clouds and inky stretches of deep space can appear dull to ordinary telescopes. But to a car-size telescope 26 million miles from Earth, they are alive with light—infrared light, or heat rays. Since its launch in August 2003, says Robert Kennicutt, an astronomer at the University of Arizona, NASA's Spitzer Space Telescope "has opened up half the universe to us."

In the process, it has exposed cosmic birthplaces. Stars take shape in clouds of gas and dust, and planets emerge in disks of debris around new stars. Early galaxies are also swathed in dust. Little visible light gets out, but these objects still emit heat—and infrared. "If you only look in visible light at these objects, you don't even see the tip of the iceberg—you see the tip of the tip of the iceberg," says Charles Lawrence of the Jet Propulsion Laboratory in Pasadena, California. "We look in the infrared because that's where the photons are."

Catching those photons, or light particles, meant going into space, because Earth's atmosphere blocks most infrared. Lyman Spitzer, the American astrophysicist for whom the telescope is named, pointed out the advantages of space telescopes back in 1946. Since then, instruments such as the legendary Hubble Space Telescope have proved him right. But the Spitzer telescope's infrared vision is the keenest ever, thanks to a mirror nearly three feet across, sensitive detectors cooled almost to absolute zero, and an orbit far from Earth's distracting heat.

Already the telescope has gleaned clues about how and where planets form, and even spotted two of them by picking up their infrared glow. It is helping astronomers understand how light and radiation from existing stars can trigger the collapse of gas clouds to form new stars. And in the far reaches of space, Spitzer is finding young galaxies glowing in the infrared. "We've made major progress in searching for galaxies at the beginning of the universe," says Giovanni Fazio of the Harvard-Smithsonian Center for Astrophysics. "I'm like a child let loose in a toy store."

The fun should continue until the telescope runs out of the liquid helium that helps cool it, in about 2008. Early in the next decade, NASA plans to launch the James Webb Space Telescope, a much larger infrared observatory. "This is the golden age of astrophysics," says Lawrence. "A thousand years from now we'll look back and say that."

OUT WITH A BANG

A star exploded 325 years ago, leaving a debris cloud 15 light-years wide called Cassiopeia A. This composite image combines data from three space telescopes. The Chandra X-ray Observatory mapped hot gas (blue and green), rich in iron and silicon from the exploded star. The Hubble Space Telescope captured wisps of cooler gas (yellow). Spitzer data (red) revealed a shell of dust from interstellar space heated by the blast's shock wave.



A COLD EYE

Infrared light concentrated by Spitzer's mirrors falls on detectors chilled close to absolute zero to detect the faint heat of distant objects. Ingenious passive cooling technologies—including a solar panel that doubles as a sun shield—help save the liquid helium coolant. Three instruments capture and analyze different infrared frequencies: the Infrared Array Camera (IRAC), Infrared Spectrograph (IRS), and Multiband Imaging Photometer (MIPS).

Solar panels

Solar panel shield

Infrared light path

Secondary mirror

Primary mirror

Instrument package

- Infrared Array Camera
- Infrared Spectrograph
- Multiband Imaging Photometer

Helium tank

Spacecraft bus

FAR FROM HOME

Most space telescopes orbit the Earth, but Spitzer orbits the sun, trailing the Earth by 26 million miles—a gap that increases by 11 million miles every year. The distance keeps the telescope far from the disruptive heat of our planet and reduces the Earth and moon to mere dots, giving Spitzer an uninterrupted view of large sections of the sky.

Infrared light path

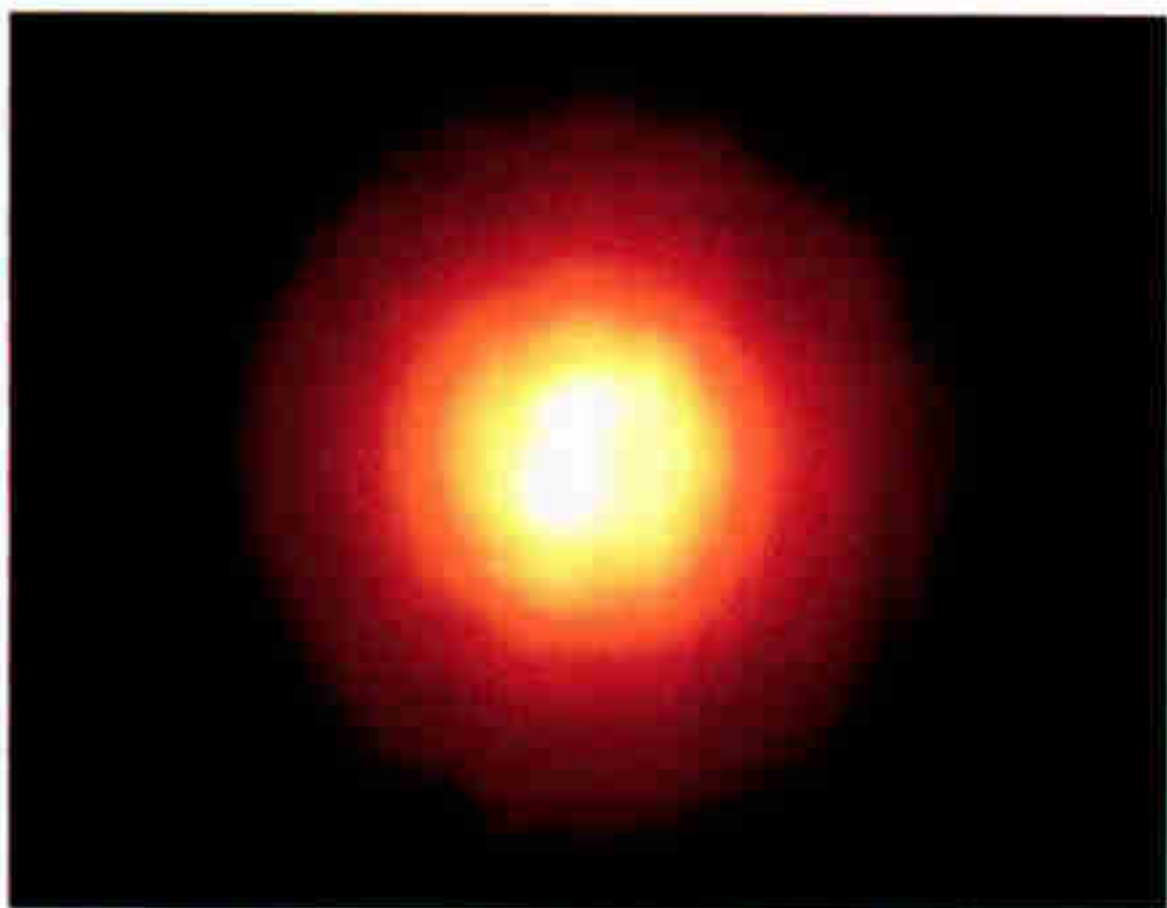
Spitzer

Earth

NOW YOU SEE IT...

Astronomers have detected more than 150 planets around other stars without actually seeing their light. But in late 2004, Spitzer captured infrared light from two Jupiter-size planets. Both lie so close to their stars that they orbit in three days and are heated to 1,300 degrees Fahrenheit or more.

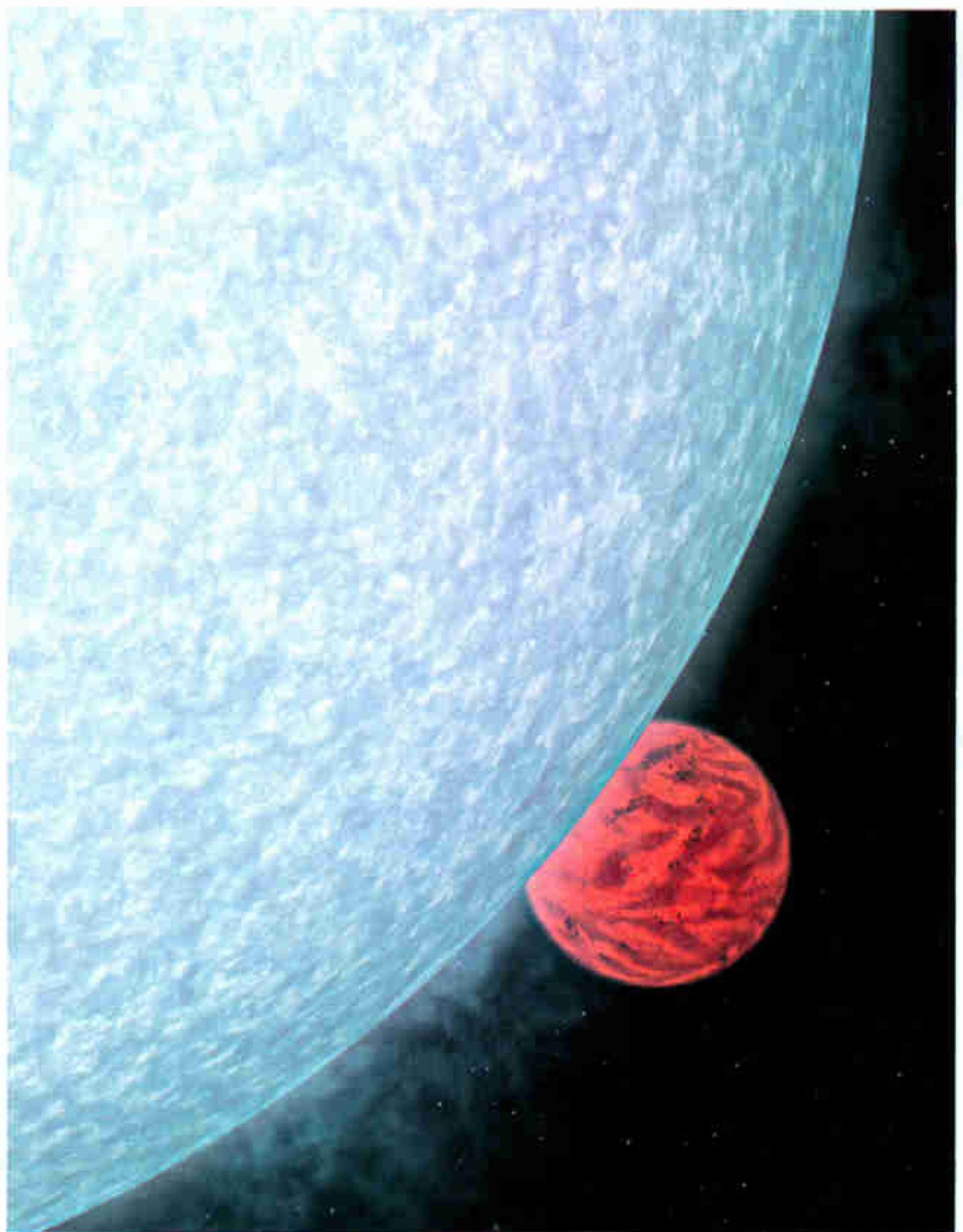
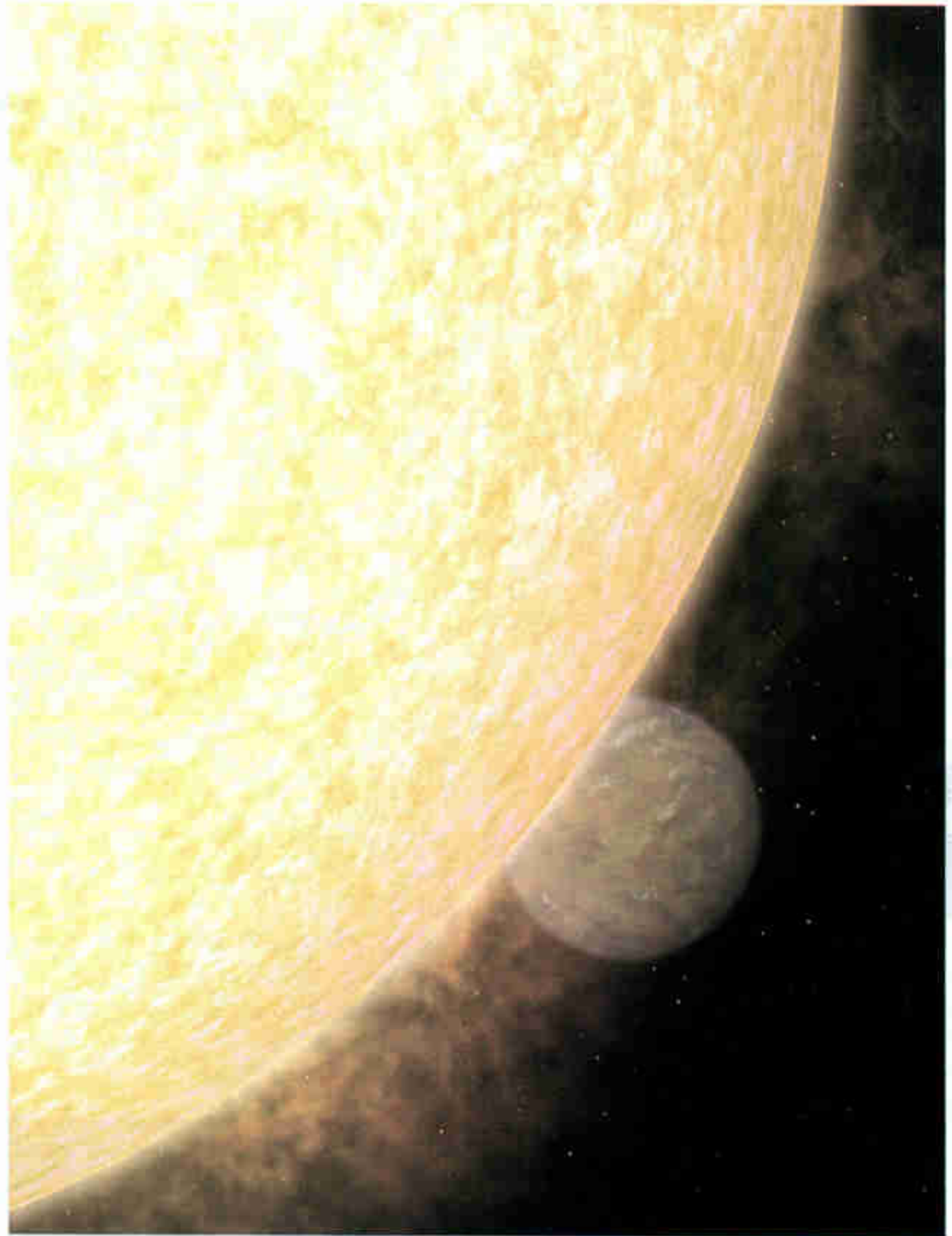
In visible light, each planet is lost in the star's glare, as shown in an artist's concept (right). But in the infrared, each emits its own light (lower right). Key to detecting this infrared glow was the fact that the planets disappear behind their stars on each orbit. As astronomers monitored each system with Spitzer, they



saw the light dim as the planet vanished, then brighten as it emerged, adding its light to the star's. "We could use the same trick to study light from even smaller planets," says David Charbonneau of the Harvard-Smithsonian Center for Astrophysics, who led a team that detected light from one planet.

Unseen planets probably lurk in a disk of debris imaged by Spitzer around the star Vega (above). The disk, at least 20 times the size of our solar system, is made of fine dust, perhaps kicked up by debris from planets shattered by giant collisions.

CELESTIAL VIEWS Zoom in on the inner Milky Way and see more of the infrared universe in an interactive photo gallery at ngm.com/0512.





A BRIGHTER HALO

Dust girdling the Sombrero galaxy is a circle of shadow in a visible-light image (below) but shines when infrared data from Spitzer are added (above). The glow—the result of stars heating the dust—reveals clumpy regions where new stars are forming. The bright spot at the galaxy's center results from a different heat source: a titanic black hole sucking in matter. □

NASA/SPACE TELESCOPE SCIENCE INSTITUTE/HUBBLE HERITAGE TEAM (BELOW); NASA/SPACE TELESCOPE SCIENCE INSTITUTE/HUBBLE HERITAGE TEAM AND NASA/JPL/CALTECH/ROBERT KENNICUTT, UNIVERSITY OF ARIZONA AND UNIVERSITY OF CAMBRIDGE (ABOVE)





10017

Grand Central Passion

BY SUSAN ORLEAN PHOTOGRAPHS BY IRA BLOCK



Sunbeams turned Grand Central Terminal into a commuters' cathedral in the 1930s. Today tall buildings block the sun, but riders from Connecticut (above) and New York still swarm in—as do hundreds of thousands of others every day. Sure it's big, but little things make it grand.

NEW-YORK HISTORICAL SOCIETY (RIGHT)





In Grand Central Terminal, people are lost and found. At the information booth—a gilded cupcake of a structure in the middle of the main concourse—they're mostly lost. They need to find their way to Poughkeepsie, Mamaroneck, the theater district, the bathroom. They've misplaced their cell phones, their maps, their tickets, their friends. They need someone, please, to show them how to get through Grand Central and how to get out. On a recent day Audrey Johnson was one of the two information officers working in the booth. Johnson is

small and solid, with marcelled curls, carefully polished lips, and nearly perfect recall. The lost souls approach her window and lob a destination at her, and she returns it before it even bounces. As many as a thousand people an hour come to the booth, and only occasionally does Johnson peek at a schedule or reference book before setting them straight. The exchanges are fast and steady. They produce a kind of boogie-woogie rhythm. While she's working, Johnson jiggles her leg back and forth, keeping time.

"Garrison?"

"2:09, track 7."

A businessman, neat as a pin: "The next train to Stamford?"

"12:37 p.m., track 104."

A Hasidic teenager: "The way to Poughkeepsie?"

"Hudson line."

An elderly woman in a Donald Duck T-shirt saying I'M THE BOSS; her husband in a Michael Jordan jersey and support hose: "Brewster?"

"Track 39, five minutes."

A blonde, eating breath mints: "I'm meeting a guy, and all he said was,



"It's the town square for eight million people," says spokesman Dan Brucker (top, modeling a conductor's hat). "If people get separated in the city, they'll meet at the information booth." Commuter trains stay on track thanks to folks like rail traffic controller Alan Gruber (above), a 33-year veteran. "The days don't drag," he says.



SIZE OF GRAND CENTRAL

TERMINAL: Covers 49 acres of land; 33 miles of track; 44 platforms—more than any other in the world

TRAINS: 660 Metro North commuter trains

COMMUTERS: About 125,000 a day

VISITORS: Some 575,000 people a day come just to eat, shop, and sightsee

COST OF RENOVATION IN 1996-98: More than 250 million dollars

RETAIL BUSINESSES: 95

OLDEST BUSINESS: The Oyster Bar, opened 1913, same year as the terminal

MEALS SERVED IN

TERMINAL RESTAURANTS: 10,000 a day

NEWSPAPER RECYCLED: Five tons a day

QUESTIONS ASKED AT THE INFORMATION BOOTH:

As many as 1,000 an hour

PERCENTAGE OF TRAINS ON TIME: 98

ITEMS IN LOST AND FOUND: 19,000 a year

MOST FREQUENTLY LOST ITEM: Coats (up to 2,000 a year)

RETURN RATE: More than 60%; close to 98% for computers and iPods

ODD ITEMS LOST: Glass eyeballs, prosthetic limbs, hairpieces, cremation ashes

MOVIES FILMED THERE: *North by Northwest*, *Midnight Run*, *The Fisher King*



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This secret platform is located below the Waldorf Astoria, next door to Grand Central. It is reported to have been used by President Franklin D. Roosevelt in 1944 to leave the hotel after giving a speech—without being seen in his wheelchair. Tourists won't find this sealed train: It's hidden from public view.

'Meet me on 43rd Street.' She looks pleadingly at Johnson, then walks away.

People are found at Grand Central too. It's rumored that most tourists and nearly all New Yorkers use the information booth as their fail-safe meeting place in case of disaster or dislocation. It is, after all, the center point of the place that feels most central in Manhattan—the place that is both totally public and yet still protected, that is both a main entry into Manhattan and a main way out.

Everything about the terminal is superlative. It's one of the biggest (49 acres) and the deepest (110 feet) as well as the busiest and the grandest terminals in the world. On an average day 700,000 people—more than the entire population of North Dakota—pass in and out of Grand Central. Sitting for an hour in the information booth, hypnotized by the rush hour flow, I feel as if I truly have seen the entire population of North Dakota striding by. In fact, I feel like if I stood in the main concourse long enough, I would eventually see every person I have ever known in my life.

You could spend years in Grand Central before you discovered all its secrets: its Whispering Gallery, its Vanderbilt family emblems, its tennis courts, its hidden railroad cars, its private ground-floor apartment (now transformed into a retro cocktail lounge).

Dan Brucker, who fields media questions about the terminal, relishes its many mysteries. One afternoon he pries me away from my perch at the information booth and whisks me into the basement known as M-42, nine stories below the lowest floor that commuters ever see. Brucker is a smallish guy with glossy black hair, thick glasses, a quick smile, and a slightly manic comportment.

"This," he says gleefully, as the basement elevator groans to a stop, "is not just the deepest and the biggest but the most secret basement in the city. What's so secret about it? During World War II there were shoot-to-kill orders if you showed up down here. Why? I'll tell you why. Why is because this was where the power came from to move the trains for



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Broken watch? You can find a quick fix at Central Watch Band Stand, where Larry Kivel (above, at right) has worked for 40 years. Terminal traffic is great for business, says Kivel, whose father opened the shop in 1952. One level down, the Lost and Found gets more than 200 cell phones a month (below), a hint at the daily rush of people short on time.

moving troops, that's why." The elevator door creaks open. Brucker dashes out, leading me into a dim room lined with humming steel boxes, the power plant for all rail traffic in the terminal. On one of the boxes I notice a little half-dollar-size red button with a modest label, Emergency Stop. Pressing the button would halt all movement on all tracks. Brucker eyes me as I look longingly at the red button. "Please, don't even think about it," he says. "Do you really want to make 125,000 people late for dinner?"

In Grand Central things are lost and found too. Nineteen thousand bits and pieces turn up in Lost and Found each year (of which more than 60 percent are eventually reunited with their owners). Like sherds of pottery in Pompeii, they describe the lives that course through the terminal. There are cell phones and iPods and umbrellas; there are diamond rings and bicycles and false teeth and books. Once an urn of human ashes was found (left deliberately by a woman whose dead husband disguised his extramarital affairs by saying he'd fallen asleep on the train); once a pair of earlobes (left by a plastic surgeon); once a mournful (but later reclaimed) basset hound.

Mike Nolan, the Lost and Found maestro, is tagging an errant BlackBerry when I stop in. He puts it aside to show me one of his favorite unclaimed items—a scale-model toy train, still in its box. It was, we decide, probably a gift that never found its way home. "Imagine," Nolan says, turning it around in his hands, "leaving a train on the train." □



WEBSITE EXCLUSIVE Find more 10017 images, field notes, and resources about Grand Central Terminal at ngm.com/0512.

5:15 pm. Dropping the kid off at college.
5:17 pm. What kid?



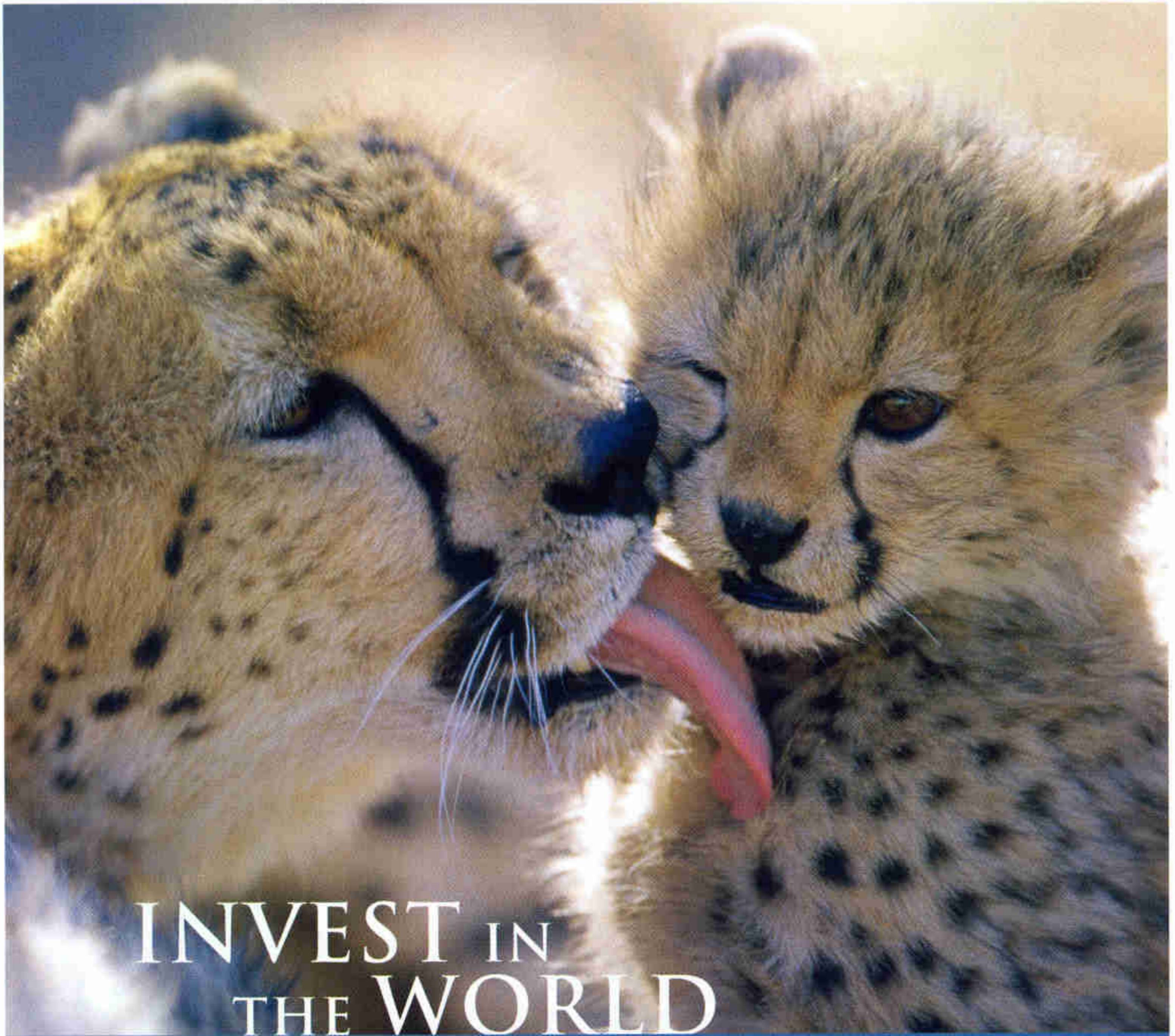
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OWNER AND PUBLISHER: National Geographic Society

GILBERT M. GROSVENOR, Chairman of the Board

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CHRIS JOHNS, Editor in Chief

HEADQUARTERS OF PUBLISHER AND PUBLICATION:

1145 Seventeenth Street NW, Washington, DC 20036

STOCKHOLDERS, BONDHOLDERS, MORTGAGE,

OTHER SECURITY HOLDERS: None

	AVERAGE NUMBER COPIES EACH ISSUE DURING PRECEDING 12 MOS.	SINGLE ISSUE NEAREST TO FILING DATE
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October 2004-September 2005 (Net Press Run)	6,896,012	6,821,828
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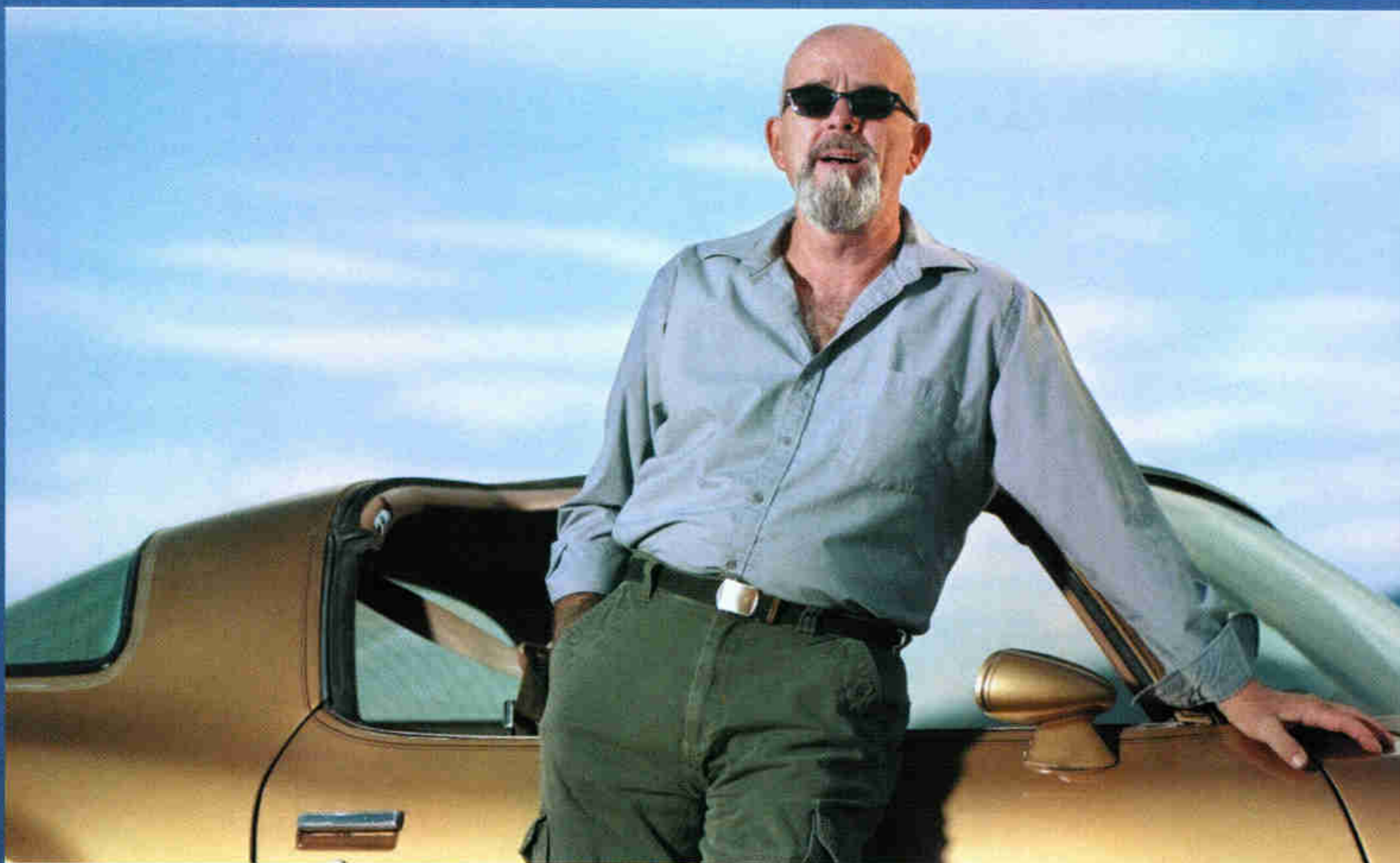
HOPE IN HELL

Overload

Within days of the 2004 tsunami, Editor Chris Johns asked picture editor Sarah Leen to start a story on global aid. “We wanted to put the overwhelming response to this disaster in a larger context by looking at how the world has responded to other crises,” says Leen.

As soon as she saw this photograph of men unloading a million pounds of donated rice in the port of Medan in Aceh Province, she wanted it in the story: “It speaks beautifully to the sheer volume of the response.” But the story team chose two other pictures instead, because they addressed additional issues. “We can see how the military gets involved in aid work in the photograph of the soldiers [pages 18-19],” says Leen. “And the clothes on the beach [pages 24-5] show how sometimes the world rushes to give, even when the gift is inappropriate.”

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Do It Yourself

BUDDHA RISING (SEE PAGE 88)



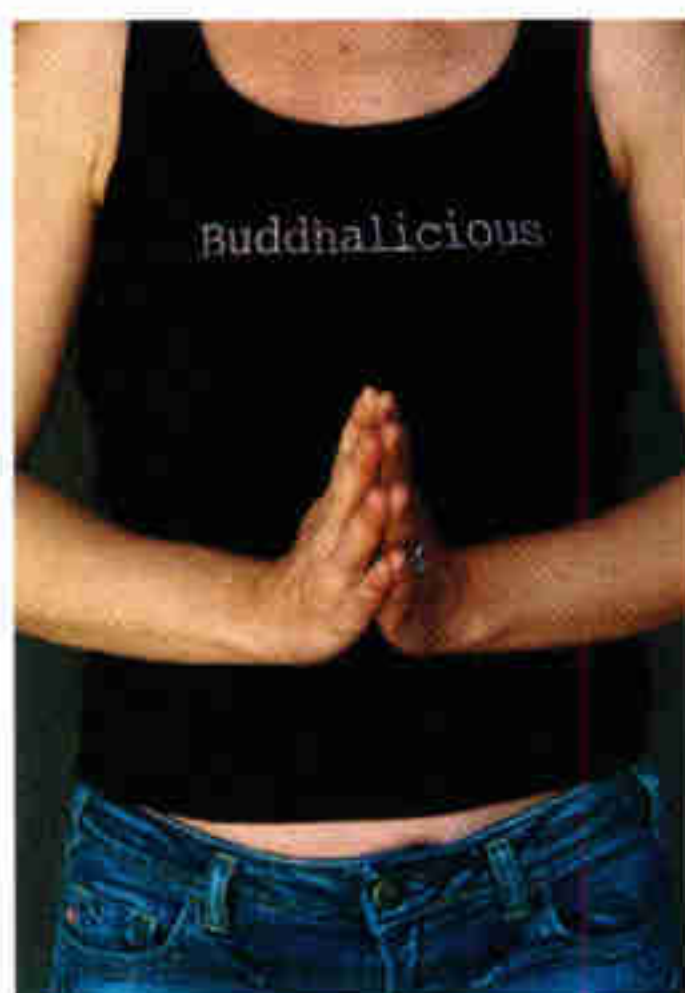
Taking a break from the work world, New Yorkers come to the Shambhala Meditation Center for group meditation.

GO THERE

The Way of the Buddha

The fifth largest religion in the world, Buddhism has become a growing presence in the West in recent decades. Its meditative, “mindful” approach to living offers a way to deal with the everyday turmoil of the 21st century. Buddhist centers in many cities and towns give guidance on meditation techniques and on how to incorporate the tenets of the Buddha’s Eight-fold Path into your daily life. Most centers welcome people from all religious and spiritual traditions.

Recent studies suggest



that stress-related illnesses like cardiovascular disease and high blood pressure can be helped by meditation. A weekend at a Buddhist retreat center allows lots of time for meditating, eating

healthful foods, and generally escaping the pace of modern life. Some centers even observe bans on talking, so disruptive chatter won’t disturb the calm.

While meditation is one aspect of Buddhism, compassionate social engagement is another. Buddhist organizations offer many opportunities to volunteer for everything from assisting hospice patients to teaching in prisons. For more on these organizations and on Buddhist centers in your region go to budghanet.net/worlddir.htm.

PICKS

3 authors

Books on Buddhist history, art, and practices abound. Here are three writers who have attracted a wide readership:

■ **The Dalai Lama**

His Holiness the 14th Dalai Lama, Tenzin Gyatso, is the exiled spiritual and political leader of the Tibetan people. A major figure on the international stage, he has written many books on the teachings and practices of Buddhism. For a list go to tibet.net/hhdl/eng/books.

■ **Thich Nhat Hanh**

The Buddhist monk mentioned in Perry Garfinkel’s story, Hanh is the author of a number of popular books on socially engaged Buddhism. For more see *Thich Nhat Hanh: Essential Writings* or go to parallax.org.

■ **Robert Thurman**

This respected Buddhist scholar and former Tibetan Buddhist monk has written a wide range of books, from a narrative of his spiritual trek through Tibet to a translation of the *Tibetan Book of the Dead*. His writings are listed at literati.net/Thurman/.

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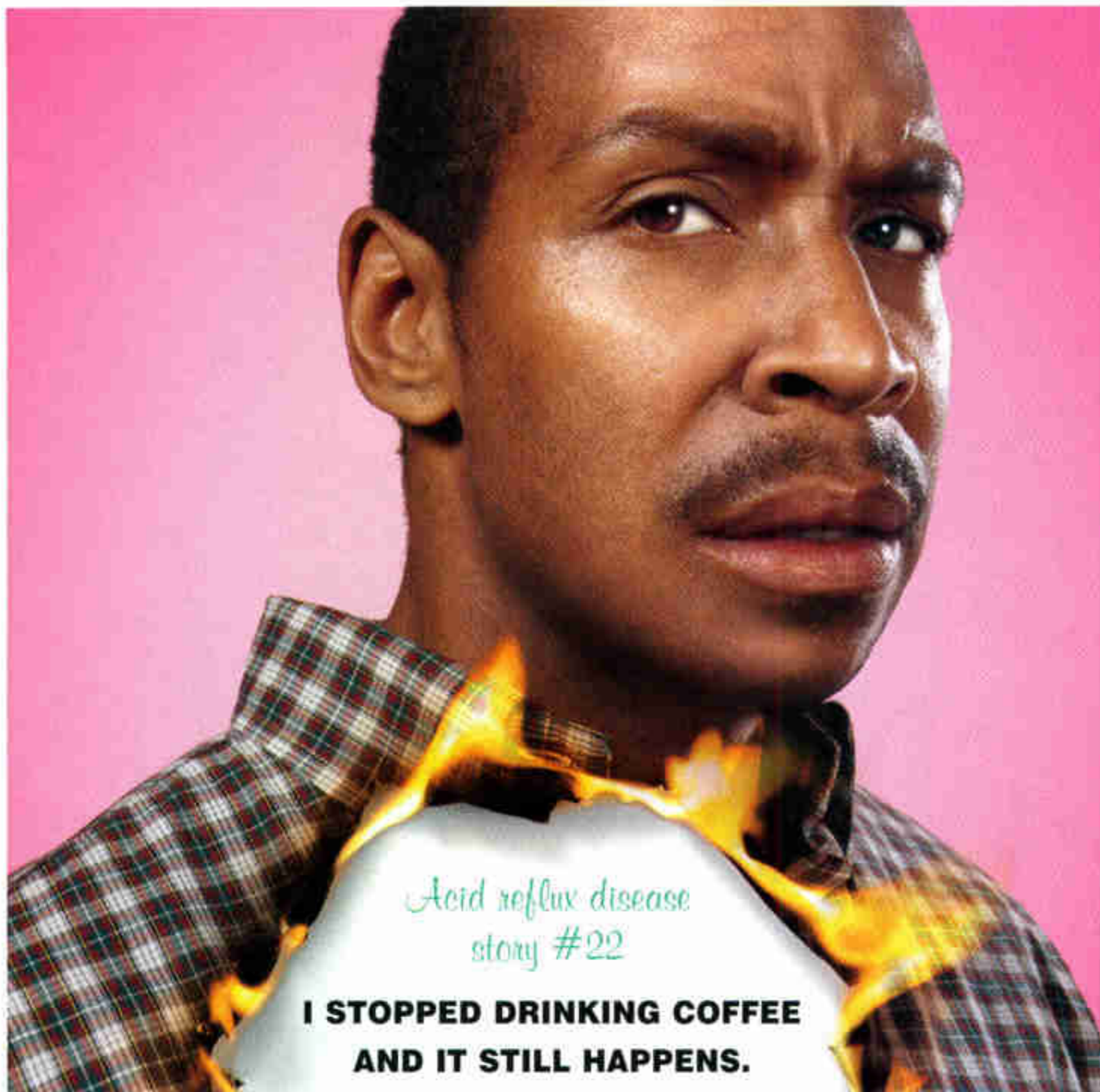
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Acid reflux disease can affect people differently. Some have a recurring sore throat and others feel like they've swallowed a blow torch — even when they avoid foods that bother them. Fortunately, there's Prevacid®. It can be taken in many forms — one that's a pill, one you can drink, and one that melts in your mouth — to help treat heartburn and many other kinds of symptoms related to acid reflux disease, in many kinds of people. Maybe it's time to see if it can help yours. So ask your doctor if there's a Prevacid that's right for you.



Put it to your acid test.

For a **FREE trial certificate**, call **1-866-90-PREVACID** or visit **prevacid.com** today.

Important Information: If you suffer from persistent heartburn two or more days a week, despite treatment and diet changes, it may be acid reflux disease (ARD). Heartburn is the most common symptom of ARD. Prevacid Capsules, Prevacid for Oral Suspension, and Prevacid® SoluTab™ (lansoprazole) Orally Disintegrating Tablets are used to treat ARD and are not right for everyone. Individual results may vary. Prescription Prevacid has a low occurrence of side effects such as diarrhea, abdominal pain, and nausea. Symptom relief does not rule out serious stomach conditions. Please see adjacent brief summary of important information and talk to your doctor.

**BRIEF SUMMARY OF PRESCRIBING
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Please read this brief summary carefully, then ask your doctor about PREVACID and visit www.prevacid.com. This advertisement does not provide all the information needed to prescribe this medicine. It does not take the place of careful discussion with your doctor. Only your doctor can determine the risks and benefits of a prescription medicine for you.

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- For healing ulcers in the first part of the small bowel (duodenal ulcers) (for 4 weeks).
- For keeping healed duodenal ulcers from coming back (studies lasted 12 months).
- For healing stomach ulcers (for up to 8 weeks).
- For healing stomach ulcers caused by medicines called non-steroidal anti-inflammatory drugs (NSAIDs) in patients who keep taking NSAIDs (studies lasted 8 weeks).
- For reducing the risk that stomach ulcers caused by NSAIDs will come back in patients with a history of a stomach ulcer who continue to take NSAIDs (studies lasted 12 weeks).
- For the relief of heartburn and other symptoms of acid reflux disease.
- For healing the damage from stomach acid rising up into the esophagus (erosive esophagitis) and to relieve symptoms, such as heartburn pain:
 - For up to 8 weeks.
 - If needed, may use for another 8 weeks.
 - If the problem comes back, may use for another 8 weeks.
- For maintaining healing of the esophagus (studies lasted 12 months).
- For lowering the amount of stomach acid in people with certain conditions which cause them to make too much acid, including those with Zollinger-Ellison syndrome.

PREVACID comes in 15 and 30 mg doses. PREVACID products should not be crushed or chewed. There are three forms of PREVACID that can be taken by mouth.

PREVACID Capsule: Capsules can be swallowed whole. They can also be opened and sprinkled into approximately 1/4 cup apple, tomato or orange juice, or on 1 tablespoon applesauce, Ensure® pudding, cottage cheese, yogurt or strained pears only.

PREVACID for Oral Suspension: It's a powder that you mix only with water.

PREVACID SoluTab: A tablet that melts in your mouth with or without water.

Who should not take PREVACID?

You should not take PREVACID if you are allergic to PREVACID or any of its ingredients. The active ingredient in PREVACID is lansoprazole.

Precautions

- PREVACID may stop your pain and other acid related symptoms, but you could still have serious stomach problems.
- **If you have phenylketonuria: PREVACID SoluTab contains 2.5 mg of phenylalanine in the 15 mg tablet and 5.1 mg in the 30 mg tablet.**
- There are no studies in pregnant women. You and your doctor should decide if PREVACID is right for you while you are pregnant. Talk with your doctor if you are pregnant or nursing.

Pediatric Use

- PREVACID can be used to treat acid reflux disease in children 1 to 11 years old (for up to 12 weeks).
- PREVACID can be used to treat acid reflux disease in children 12 to 17 years old (for up to 8 weeks).
- The most common side effects in patients 1 to 11 years old were constipation (5%) and headache (3%).
- The most common side effects in patients 12 to 17 years old were headache (7%), abdominal pain (5%), nausea (3%) and dizziness (3%).

Most Common Side Effects

- The most common side effects in adults were diarrhea (3.8%), abdominal pain (2.1%) and nausea (1.3%).
- There are other, less common side effects. Ask your doctor for a more complete list.

What I Should Know About Taking PREVACID with Other Medication?

Tell your doctor about all your medicines. PREVACID and some medicines can affect each other. Be sure to tell your doctor if you take:

- Sucralfate: PREVACID should be taken 30 minutes before sucralfate.
- Theophylline: PREVACID may make your theophylline level lower. Your blood level may need to be checked.

Some patients taking drugs like PREVACID and warfarin had blood clotting times that were too long. If you take warfarin, your doctor may check your blood clotting time to make sure it is not too long.

Also, tell your doctor if you are taking ketoconazole, ampicillin, iron salts, or digoxin. Always talk to your doctor before starting any new medications.



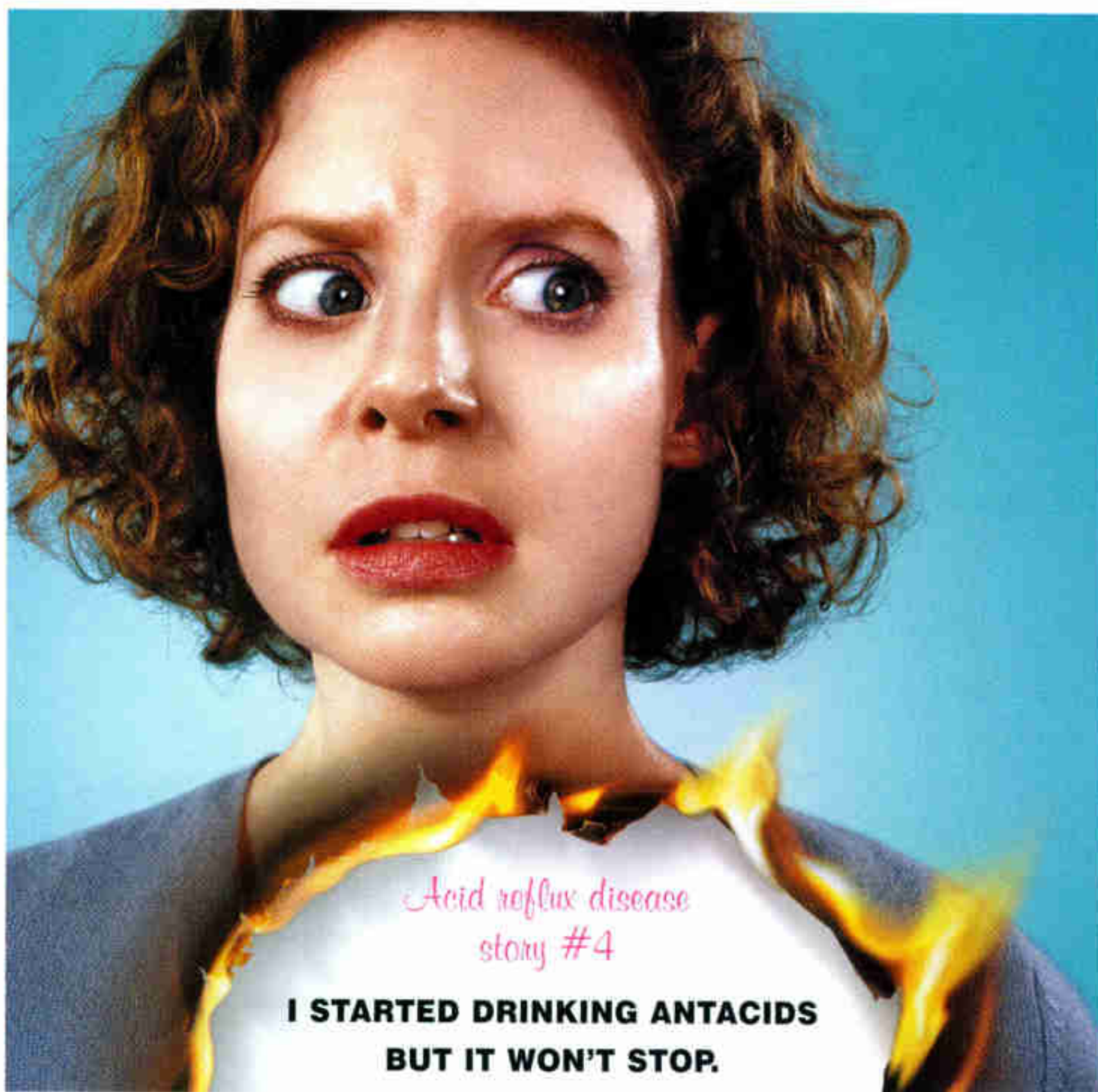
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For more detailed information, see full prescribing information or contact TAP Medical Information at 1-800-622-2011.

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People deal with acid reflux disease in different ways. Some find limited success with over-the-counter treatments such as antacids while others need relief that can last all day. Fortunately, there's Prevacid®. It can be taken in many forms — one that's a pill, one you can drink, and one that melts in your mouth — to help treat heartburn and many other kinds of symptoms related to acid reflux disease, in many kinds of people. Maybe it's time to see if it can help yours. So ask your doctor if there's a Prevacid that's right for you.

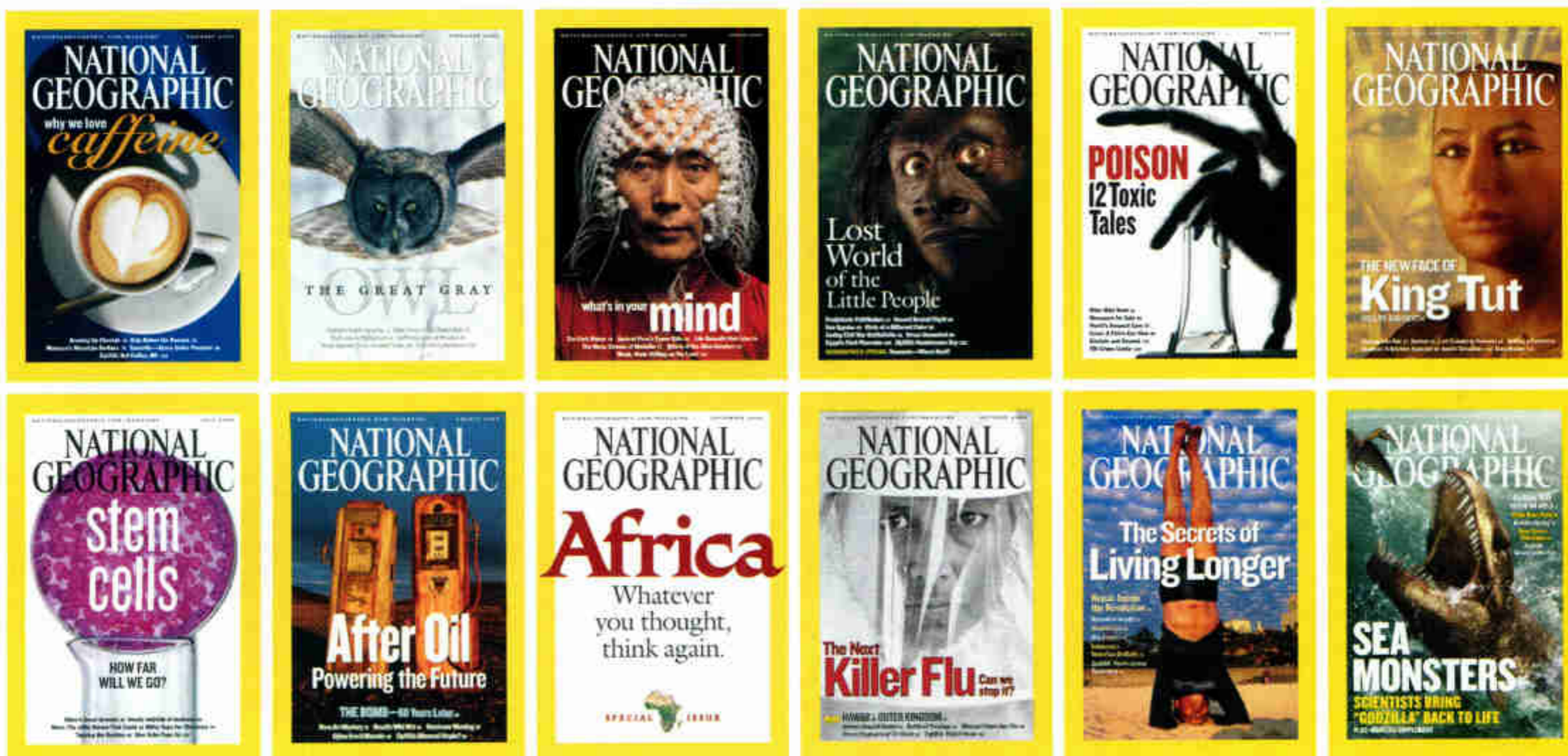


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Important Information: If you suffer from persistent heartburn two or more days a week, despite treatment and diet changes, it may be acid reflux disease (ARD). Heartburn is the most common symptom of ARD. Prevacid Capsules, Prevacid for Oral Suspension, and Prevacid® SoluTab™ (lansoprazole) Orally Disintegrating Tablets are used to treat ARD and are not right for everyone. Individual results may vary. Prescription Prevacid has a low occurrence of side effects such as diarrhea, abdominal pain, and nausea. Symptom relief does not rule out serious stomach conditions. Please see adjacent brief summary of important information and talk to your doctor.

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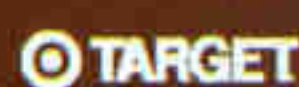
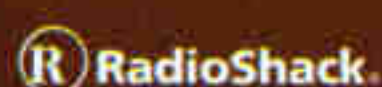
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Flashback



The tooth of a great white shark pales in comparison to that of a megalodon—a great white's extinct relative.

SEA MONSTERS

Big Bite It was nearly 50 feet long and weighed 5 tons, with a mouth that could have gulped down a refrigerator. But we can only guess what *Carcharodon megalodon* looked like before its extinction about a million years ago. Though ancient sharks' teeth are among the most plentiful prehistoric animal remains—this 1927 image shows a six-inch megalodon tooth framing a modern great white's—their skeletons were made of cartilage, and many decomposed too quickly to become part of the fossil record. —Margaret G. Zackowitz

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